BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 23.] 1926. [No. 9

AMOEBIASIS AND DYSENTERY.

Amoebiasis.

Brown (Philip W.). **The Nature, Incidence and Treatment of Endamebiasis.**—*Jl. Amer. Med. Assoc.* 1926. Feb. 13. Vol. 86. No. 7. pp. 457–462. With 1 text fig. [18 refs.]

A careful review and discussion of cases observed in the Mayo Clinic.

Group 1. 153 cases showing active dysentery, or liver abscess, when admitted to the clinic.

Group 2. 258 cases in which the chief complaint was diarrhoea.

Group 3. 122 cases in which the endamoeba was found without recorded history of dysentery—the pure " carrier " cases.

The cases were investigated by means of: (1) history; (2) stool test; (3) proctoscopy; (4) barium enema; (5) gastric test meal. The barium enema and roentgenogram proved of negative rather than positive value. The gastric test meal showed that treatment may be influenced by the results of gastric analysis. Continued diarrhoea without gross evidence of bowel ulceration may be more influenced by achlorhydria than by the coexistent endamoeba. Supplementing antiamoebic treatment with dil. HCl. will do much to effect complete relief from the intestinal symptoms.

From this study the author concludes that :—

1. *E. histolytica* is " being heard of " more and more throughout the temperate zone. More attention must be paid to uncooked foods and drinking water supply.

2. Repeated examinations of stools are essential to diagnosis in all forms of dysentery. In this series positive findings (Endamoeba) occurred in 68 per cent. of first, 92 per cent. of second, and 98 per cent. of third examinations. [The author makes no mention of the distinctive microscopic character (cellular) of the bowel exudate.]

3. Proctoscopic examination is absolutely necessary to distinguish amoebic from idiopathic ulcerative colitis.

4. To establish a cure is very difficult; repeated examinations of stools must be made over a period of months, and reinfection must be prevented.

(K 3008) Wt.P.13/215 1,625 9/26 H & Sp Gp 52

5. Ipecac or its derivatives are effective in only 58 to 70 per cent. of cases.

6. Emetine and arsphenamin form a useful combination.

7. With the resistant case, persist rather than temporize. The parasite can eventually be eradicated.

The author thinks with Orticoni and Gazzola that *E. coli* and *E. nana* may be pathogenic in some cases. There were cases in which only these two parasites were identified. They will thrive in sufficient numbers to produce actual symptoms if the body tissues are altered by factors such as nervous strain, endocrine malfunction, or dietary deficiency. McCarrison's well-known observations on colonic disturbances in monkeys produced by a deficient diet, and the intense diarrhoea that then followed introduction of the endamoeba, lend support to this view.

H. M. Hanschell.

Béteau (J. P.). A propos d'une épidémie de dysenterie amibienne autochtone. Essai de traitement bismuthique. [**An Epidemic of Autochthonous Amoebic Dysentery.**]—*Progrès Méd.* 1926. Jan. 9. No. 2. pp. 47–51.

The author gives a summary of his observations on an epidemic of "amoebic" dysentery, 41 cases, in a mental hospital; a detailed account is promised later. No mention is made of the data on which the diagnosis was based.

The treatments tried were:—

(1) "Ipecac. à la brésilienne." 4 cases. Return of stools to normal and disappearance of cysts.

(2) *Emetine-arsenical treatment,* 25 cases. Return of stools to normal —and disappearance of amoebae and/or cysts in 10 of the 25 cases. Five died. The other 10 improved, but cysts or amoebae persisted, and in one case tenderness of left lobe of liver developed.

(3) *Bismuth treatment,* 12 cases. 0·30 gm. Iodobismuthate of quinine injected intramuscularly every 3 or 4 days. The stools rapidly decreased in number. In 9 out of the 12 amoebae and cysts had disappeared, by the 8th to the 24th day, after 3 to 6 injections. In the 3 cases where treatment failed, there was either lambliasis, tubercle, malaria, albuminuria and cachexia, as complications. The author concludes that the bismuth treatment of amoebic dysentery compares advantageously with other treatments; and points out that 3 of the cases in which this treatment caused disappearance of cysts were chronic carriers. He notes, however, that a final appraisement must wait until the cases treated have been longer observed after treatment.

[The finding of amoebae and/or cysts in mucosanguineous stools does not by that much declare amoebic dysentery. An *epidemic* of amoebic dysentery has not yet been proved to occur anywhere. That such an outbreak should happen in a lunatic asylum (the almost perpetual reserve of bacillary dysentery) cannot be accepted without far more exact investigation than is reported in this paper.]

H. M. H.

Albert (Henry). **Detection of Amebae in Cases of Chronic Systemic Amebic Infection.**—*Amer. Jl. Public Health.* 1926. Apr. Vol. 16. No. 4. pp. 352–354. [6 refs.]

In view of the great importance of being certain of a diagnosis of "*Ameba dysenteriae,*" the author gives a brief outline of directions

for the collection of specimens of faeces. The patients should be given bile salts and six separate specimens on six consecutive days be collected and examined. Two methods of preparing specimens for microscopic examination are given: (1) Direct smear stained with iodine-eosin; and (2) fixed smear stained with Haidenhain's iron-haematoxylin. There are so many other amoebae of structure similar to that of "*Ameba dysenteriae*" and other protozoa and cells of somewhat similar morphology, that the diagnosis of dysentery amoebae should not be left to anyone not entirely familiar with their definite recognition.

H. M. H.

Moretti (P.). Contributo allo studio dell' amebiasi in Sicilia. [**Amoebiasis in Sicily.**]—*Riforma Med.* 1926. Apr. 26. Vol. 42. No. 17. pp. 388–391. [1 ref.]

Conditions due to or associated with *E. histolytica* in Sicily were a few years ago attributed to sporadic cases coming from the tropics, but the numbers of persons affected have continued to increase and it is now believed that the island is becoming an endemic centre of amoebiasis. The author has himself observed 176 cases and in the present paper these are analysed and divided into different clinical groups. The commonest syndrome is that of a chronic entero-colitis, of which there were 71 instances, or 40·3 per cent. Acute forms, common in the tropics, were seen in 2·2 per cent. only. Twenty-four (or 13·6 per cent.) suffered from hepatic complications. This is 3 per cent. less than reported by Izar in 1922, and the diminution is ascribed to greater care and accuracy in diagnosis in the early stages with consequent early treatment. A form of the disease in which there is much wasting is believed to be due to the toxic action of amoebae localized in the submucosa of the intestine and has proved very resistant to treatment. One case is mentioned in which the patient suffered from a threefold infection of amoebiasis, syphilis, and undulant fever. The article is of much interest and value.

H. Harold Scott.

Castex (Mariano R.) & Greenway (Daniel). Sur certaines formes et manifestations cliniques peu connues de l'amibiase humaine. [**Little-known Clinical Manifestations of Human Amoebiasis.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1926. Mar. 11. Year 42. 3rd Ser. Vol. 50. No. 9. pp. 376–378. [8 refs.]

The authors, Professors at the University of Buenos Aires, in previous publications had recorded—

1. Of 614 cases of chronic digestive trouble 24·5 per cent. harboured *Entamoeba histolytica*.

2. In a further series of 2,023 cases *E. histolytica* was found in 23·6 per cent.

They note that these figures surpass any hitherto published except, however, those of Mentz von Krog (Oslo), who finds three-fourths of the population of Norway infected with *E. histolytica*. The authors have found that clinical cases of—(1) obstinate constipation; (2) chronic headaches; (3) nephritis (a) with amoebae in the urine, (b) with amoebae in the stools only; both types often accompanied by arterial hypertension; (4) cases with no renal trouble yet with permanent arterial

hypertension ; (5) intestinal polyposis ; and (6) a case with Banti's syndrome—all showed *E. histolytica* in the stools ; and all resisted all the usual remedies for their condition and made more or less rapid and complete recovery with emetine treatment and the consequent disappearance of *E. histolytica* from the stools.

H. M. H.

Lamberts (W. H.). Beiträge zur Diagnose und Therapie der Amöbendysenterie. [**The Diagnosis and Treatment of Amoebic Dysentery.**]—*Klin. Woch.* 1926. Mar. 19. Vol. 5. No. 12. pp. 513–516.

The author records the frequency of amoebic dysentery in Central and South America and in the West Indies. He describes the various forms of *E. histolytica* found in the stools of patients, and the symptoms and physical signs, and blood picture of acute and chronic dysentery and liver abscess. Certain diets are recommended. Emetine hydrochloride effective in acute dysentery usually failed in chronic cases, in which emetine bismuth iodide gave better results. In his experience yatren is the drug of choice for all cases and for hepatitis or small liver abscesses. It is not toxic. As quinine in malaria, so a like part is to be played by yatren in amoebiasis. He points out the prophylactic value of yatren pills.

H. M. H.

Abbatucci (S.). L'évolution de la dysenterie amibienne en Indochine depuis l'avènement de l'émétine. [**The History of Amoebic Dysentery in Indo-China since the Emetine Epoch.**]—*Presse Méd.* 1926. Mar. 31. Vol. 34. No. 26. p. 411. With 5 charts in text.

This paper is illustrated by graphs showing cases and mortality from 1903 to 1923. They show (apart from some oscillations during the war years) a steady fall in the number both of cases and of deaths from amoebic dysentery among Europeans and Natives. The fall is most marked after 1913, the year in which emetine therapy began. It is claimed that this drug has not only alleviated and cured the disease but has also prevented it.—

Thus among the troops :—

		Cases.	Deaths.
Annam-Tonkin.			
Europeans	1903 ...	330 ...	25
,, ...	1923 ...	80 ...	1
Natives	1903 ...	175 ...	18
,, ...	1923 ...	22 ...	0
Cochin-China—Cambodia.			
Europeans	1904 ...	580 ...	75
,, ...	1923 ...	65 ...	2
Natives	1908 ...	126 ...	18
,, ...	1923 ...	18 ...	0

and in the same Provinces :—

Europeans ...	1912 ...	Liver abscess, 48 ; deaths, 20.
,, ...	1923 ...	,, ,, 0 ; ,, 0.

Stricter sanitary measures, however, have also played a part in this betterment.

H. M. H.

Trabaud. L'amibiase camouflée. [**Occult Amoebiasis.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1926. Apr. 22. Year 42. 3rd Ser. Vol. 50. No. 13. pp. 614–617. [3 refs.]

Brief description of three types of illness, observed in Beyrouth and attributed to amoebic infection, on the grounds that there was former

or present dysentery, or that *E. histolytica* might be found in the stools (according or not to opportunity and frequency of stool examination) ; and mainly that in all three the syndrome disappeared after treatment with emetine.

1. *Forme pseudo-dothiénentérique.*—Typhoid faeces, dirty tongue, gurgling in iliac fossae, diarrhoea, enlarged liver and spleen, continued fever, and sometimes rose or purpuric spots. Blood culture negative and no malarial parasites found. R.b.c. 3,500,000, white 10,000–20,000.

2. *Forme pseudo-granulique.*—Resembling the preceding in its main features. Spots are absent and the fever shows a daily rise with morning remissions. Râles in chest, muco-purulent expectoration. Rapid wasting and formation of bed sores. Blood culture negative. No Koch's bacilli found in sputa. Stools dysenteric and history of former dysentery.

3. *Forme pseudo-appendiculaire.*—Polynuclear leucocytosis with abdominal signs suggesting appendicitis. This type is difficult to distinguish from the cholecystitis (amoebic) already described by the author. The stools reveal *E. histolytica*, and emetine should be tried before surgical intervention.

H. M. H.

Brumpt (E.). Quelques faits nouveaux concernant les amibes intestinales de l'homme et leur culture. [**New Facts concerning the Intestinal Amoebae of Man and their Cultivation.**]—*Le Bull. Méd.* 1926. Jan. 27,30. Vol. 40. No. 5. pp. 105–109.

The author first discusses *E. dysenteriae* and its *histolytica* and *minuta* forms. Since the discovery by Quincke and Roos (1893) and Hubert (1903) of the four nucleated cysts of the true dysentery amoeba, these cysts have been found in many countries—thus in 5 per cent. of the population in England ; France over 4 per cent. ; California 26·5 per cent. ; other parts of U.S.A. 5–10 per cent. ; Venezuela 30 per cent. ; Buenos Aires 24·5 per cent. These figures show that four nucleated cysts are as common in the people of countries where amoebic dysentery is a rarity as in those where it is very frequent.

Martini (1908) ; Vincent and Noc (1909) ; Walker and Sellards (1913) have demonstrated the existence of carriers of dysentery amoebae who show no clinical symptoms. The explanation is lacking why the amoeba produces dysentery in one in four persons infested in the Philippines ; one in ten or twenty in Macedonia, Morocco, Senegal, India and Indo-China ; while in England, where nearly two million cyst passers exist, only one or two autochthonous cases are observed each year. These surprising epidemiological facts become easier to understand if it be admitted that the work of Sohei Shimura (1918) and the author's (1926) show that this widespread four nucleated cyst amoeba is perhaps not pathogenic at all and is a species distinct from *E. dysenteriae*. This distinct species has been named by the author (1925) *Entamoeba dispar.** A man who had never suffered from intestinal symptoms had travelled before 1912 in Algeria, Spain, and Equatorial Africa. Since 1912 his stools had always shown numerous four nucleated cysts : he remained always healthy. Using the methods that had invariably been successful with true dysentery amoebae, the author always failed to infect cats with the amoebae from this healthy carrier. But on using the method of Sellards and Theiler, Boeck and Drbohlav (production of intestinal stasis by occlusion

* For a critical study of this species see this *Bulletin*, No. 1, p. 35.

of the cat's anus after injection of infected material), the author succeeded in infecting kittens with the amoebae from the above healthy carrier, with the cysts by the rectal or buccal route, with vegetative forms by injecting them per rectum. Drbohlav cultivated (1926) these same amoebae and infected kittens with the culture.

The author gives a detailed description of *E. dispar*, as seen in the kitten, in the human being and in culture, vegetative and encysted forms, living and killed, stained and unstained. Erythrocytes were very rarely found in them in the kittens—never in man or in culture. By the author the vegetative forms are distinguished from *E. dysenteriae* in various minor points—the cysts are indistinguishable. [Readers interested are referred to the paper.]

The exact localization of this amoeba in man is not known. In the kitten they multiply on the mucous surface of the large and sometimes on the last few centimetres of the small intestine, penetrating to the muscularis mucosae which they appear not to traverse. In certain kittens infected also with dysentery bacteria the amoebae appeared to penetrate more readily the mucosa and the submucous lymphatics. They were once found in a follicle of the large intestine, but never in the lymph glands of the large intestine. The livers of 38 infected kittens never showed abscess or any lesion that could be attributed to the action of the amoebae. They cause a discrete slow surface necrosis of the mucosa, without any of the congestion, inflammatory thickening and ulceration characteristic of *E. dysenteriae*, although in far greater numbers in fact than usually found in *E. dysenteriae* infections. Three cats cured of *E. dispar* succumbed later to *E. dysenteriae* culture infection and three cats while still infected with *E. dispar* were superinfected with *E. dysenteriae*. *E. dispar* is distinguished from *E. dysenteriae* by its mode of nutrition in man, by its accidental haematophagy, and its pathogenic rôle in the cat, by its appearance in culture, by its vast geographical distribution and by the immense number of subjects in whom it appears. In the human source, *E. dispar* vegetative forms were always small and very little mobile at 15° C.–20° C.—at which temperature *E. dysenteriae* vegetative forms are active. *E. dispar* also is less easily stained than *E. dysenteriae*.

It is clear that the presence in the stools of four nucleated cysts of amoebae, in patients with various intestinal troubles, does not justify the dangerous treatment with emetine. A description of *E. coli* is given and the paper concludes with an account of the culture of amoebae by Boeck and Drbohlav.

H. M. H.

Brumpt (E.). L'*Entamoeba coli* peut-elle être pathogène pour l'homme? Expérimentalement elle peut l'être pour le chat. [**Is *E. coli* ever pathogenic to Man? Experimentally it is to Cat.**]—*Bull. Acad. Méd.* 1926. Mar. 16. Year 90. 3rd Ser. Vol. 95. No. 11. pp. 284–293. With 5 figs.

In the stools of a human case of mucous diarrhoea, there were still present, after treatment, cysts of *E. coli*, *E. dispar*, *Endolimax nana*, and *Giardia intestinalis*. The stools had never revealed *E. dysenteriae*. The patient was purged and some of the resulting stool injected into the rectum of kitten No. 1, whose anus was then collodion sealed for 48 hours. The animal developed diarrhoea

and its stools showed numerous non-haematophagous amoebae and some *Trichomonas felis*. On the 5th day after the injection the ill animal was killed. Autopsy revealed an invagination of the small intestine occluding the gut. The large intestine showed superficial ulcerations. The mucus from gut revealed non-haematophagous "*E. dispar*" and *E. coli*; (the types found are illustrated). Kitten No. 2 was injected at the same time as No. 1 with the same material and by the same method. Scanty "*E. dispar*" only were found in its stools, and later these disappeared altogether; the animal meanwhile had kept well and put on weight. It was then injected with *E. dysenteriae*. Dysentery was produced, and autopsy revealed the typical amoebae, ulcerations, and tissue invasion.

The author gives a brief review of the experiments and observations of others on the pathogenicity of *E. coli*—notably HAMMERSCHMIDT'S finding of *E. coli* deep in the wall of ileum, caecum, and in Lieberkühn's glands, at autopsy on 2 cases of typhoid fever and a case of leukaemia [*ante*, p. 374]. The author notes that further experimental study can alone interpret more accurately the facts observed; and suggests that so far his experiments show that *E. coli* can, perhaps in exceptional circumstances, penetrate small ulcerations which it may have itself produced, or which were first started by co-existing "*E. dispar*."

H. M. H.

WILLMORE (J. Graham) & MARTINDALE (W. Harrison). **The Treatment of Amoebic Dysentery by Auremetine.**—*Brit. Med. Jl.* 1926. Mar. 20. pp. 525–527. [3 refs].

The authors reported in May 1923 results of treatment in a series of 503 cases of amoebic dysentery [see this *Bulletin*, Vol. 20, pp. 708–10]. Treatment consisted in 12 grains emetine intramuscularly and 60 grains E.B.I. per os in 20 days; emetol (solution of emetine base in olive oil), given per rectum; and emetine periodide by mouth. With all these, however, more than one third of the cases had relapsed in less than six months, and a much larger proportion have relapsed since.

Extensive trial was then given to drugs such as activated quinine base, conessine, stovarsol, Bayer 205, a varied group of so-called intestinal disinfectants, flavine, etc. Results confirmed their previously expressed opinion that radical cure must centre round some form of emetine. Yatren per os and per rectum, in four refractory cases, had no effect even as a temporary palliative. (There had been no opportunity of trying it by appendicostomy.) Emetren (Yatren emetine compound for intramuscular injection) failed in the one case in which it was tried. Stovarsol combined with emetine preparations gave decidedly better results than either drug singly.

FAIRBROTHER and RENSHAW'S work on the potentialities of the aniline dye auramine prompted the preparation of a compound of auramine with emetine for oral use. This compound, for which the name *auremetine* is suggested, is a dark maroon powder, stable and insoluble in water. It is a combination of the hydriodide periodides of emetine and auramine with the approximate composition:

Emetine	...	...	...	28 per cent.
Auramine	...	...	...	16 per cent.
Iodine	...	...	...	56 per cent.

Tested by Major BROWN it was found inhibitory to the growth of free living amoebae nearly to the same extent as emetine or conessine under the same conditions. *It is to be noted that the drug contains only* 28 *per cent. of emetine, the constituent most poisonous to the higher animals.* Tests of the effect on auremetine of physiological acid and alkali showed a slow steady decomposition with freeing of emetine and the dye; probably in the human intestine a more ready decomposition occurs, since administration is quickly followed by passage of orange-coloured faeces. Its use per os has been found free from vomiting, nausea, abdominal pain, purging. It is much less depressing than hypodermically administered emetine.

Bismuth subnitrate in massive doses (as recommended by JAMES and DEEKS) has been found to be a valuable adjuvant to any and every form of specific anti-amoebic treatment, and particularly so in that now to be described. Though continued for months it has caused no symptoms of poisoning. The auremetine treatment (modified to suit individual cases) was roughly as follows:—

1. *Acute cases*: (*a*) Auremetine 1 gr. in soft gelatin capsule four times daily after food on alternate days for 7 days, and then daily to a total of 40 or 60 grains ingested; (*b*) Stovarsol 4 grs. t.i.d. daily for 7 days, on alternate days with the auremetine; (*c*) on stovarsol days a rectal injection of emetol 2 drachms (=1 grain emetine base) in 6 drachms ether and 12 oz. olive oil; (*d*) bismuth, 1 drachm, 3-hourly for 20 days, and ter in die daily.

2. *Chronic or cyst carrying cases* were given: (*a*) auremetine; and (*b*) stovarsol on alternate days as described above; (*c*) bismuth 1 drachm ter in die before food.

It is necessary to control all cases by routine sigmoidoscopy. Eight cases of carcinoma developing in site of amoebic ulcer have been seen during the past five years. Areas of submucous amoebic infiltration from which teeming amoebae may be scraped may be found although repeated microscopic examination of stools had been negative. Some individuals show idiosyncrasy towards stovarsol, especially after repeated courses. One death from this drug has been heard of, and one case under treatment developed intense dermatitis with purpuric spots after only 8 grains. As a minor precaution patients were given glucose daily during stovarsol treatment.

It is to be noted that the cases of amoebic dysentery dealt with were the residue of pensioners infected during or before the great war, many of whom had been through every dysentery centre in the country. The authors claim no more than that the introduction of auremetine and the above methods of treatment have given some gratifying and more hopeful *immediate* results than any other essayed. The table accompanying this paper gives the results of this treatment. In the results column "Responded" has been deliberately chosen as being less committal than any other. It is meant to convey that the patient regained his health, lost all clinical signs and symptoms of his disease (including sigmoidoscopic findings), that his stools were negative on repeated examination, and that he had remained free from any evidence of infection for at least six months after completing treatment. The "Responded" results in the table give unquestionable justification for the rather modest claim for the efficacy of this treatment put forward by the authors—and especially so if one notes the type of case dealt with.

H. M. H.

Deuskar (V.N.). **A Note on the Use of Emetine Intravenously.**—*Indian Med. Gaz.* 1926. Apr. Vol. 61. No. 4. pp. 165–167.

1. June-December, 1925, Haddo Hospital, Port Blair, 70 cases of amoebiasis (active *E. histolytica* present in all) were treated by emetine intravenously and Deek's bismuth therapy: case mortality 12½ per cent.

2. Nine one grain emetine injections on consecutive days; 6 days interval, and then 6 more intravenous injections of one grain of emetine —each patient thus received 15 grains of emetine.

3. The series included cases with as low a weight as 83 lbs. and as low a haemoglobin value as 40 per cent., also cases anaemic and debilitated in consequence of coexistent infections, e.g. acute and chronic malaria, bronchitis, ankylostomiasis, sprue.

4. No toxic symptoms due to the intravenous emetine were noted, and it was painless.

5. Provided that total emetine so given does not exceed 12 grains and rest in bed can be enforced, this form of treatment might safely be extended to patients in private practice.

6. It is still undetermined whether intravenous emetine gives better therapeutic results.

7. Meanwhile—P.M. examination of the fatal cases revealed extensive thickening and fibrosis of the gut. Some relapses also occurred within 46 to 136 days. Results therefore appear as disappointing, in chronic cases, under this treatment as with any other form of emetine therapy.

H. M. H.

Ravaut (Paul). Les arsenicaux, par voie buccale dans le traitement, la prophylaxie, la prévention de l'amibiase et de diverses infections intestinales; efficacité de l'arsénobenzol (606). [**Arsenobenzol by the Mouth in the Treatment and Prophylaxis of Amoebiasis and other Intestinal Infections.**]—*Presse Méd.* 1926. Apr. 21. Vol. 34. No. 32. pp. 497–499. [6 refs.]

In 1915 the author cured a case of chronic amoebic dysentery, in which emetine and arsenic injections had been of no avail, by giving by mouth doses of 10 and 20 cgm. of novarsenobenzol dissolved in water. Motile and encysted amoebae disappeared from the stools. In this paper he reviews his further experience of this therapy. While emphasizing that his experience has been obtained with a somewhat limited number of cases, yet so successful has it been that warrant is thereby given for his plea for its careful testing on a larger series of cases.

In the treatment of amoebiasis he divides cases into two groups, each requiring its distinctive therapy. Acute and subacute cases must be treated by injections. In chronic cases, with encysted parasites, "*cyst sowers*," recourse must be had to local treatment by the buccal route; and it is especially in these last that strikingly successful results, as measured by disappearance of all forms of the parasite, *including cysts*, and return of general health to the patient, are obtained by means of the original arsenobenzol, 606, given by mouth. (It causes also the disappearance of free and encysted *Lamblia*, though for this a longer course of treatment is required.) It may be given in solution in water, or more conveniently in tablets made up with gluten, *which should be crushed before swallowing*, (sold as Narsenol tablets)

10 cgm. in each tablet. 5 or 6 of these are given in the first 24 hours, after which the dose is lowered to 2 or 3 tablets a day for several days. The fact that cysts are destroyed by this medicament opens the way to effective prophylaxis of the disease, and as he has found by actual experiment that over a long period of time 10 to 30 cgm. can be safely taken by mouth twice a week, it is possible by this means (as with quinine and malaria) to prevent individual infection. He cites in support PETZETAKIS' experiment—failure to infect with dysentery amoebae a human being who was taking stovarsol per os. Dr. Ravaut believes arsenobenzol to be superior in anti-intestinal-protozoal effects to stovarsol and E.B.I. He notes clearly, however, that no one remedy is ever invariably successful. Each of these remedies will on occasion be found best for some particular type of patient.

For the control, and even eradication, of amoebiasis in endemic areas arsenobenzol by the oral route holds out now the best chances of success.

H. M. H.

BUCHMANN (Max). Behandlung von Amöbendysenterie bei Erwachsenen und Kindern mit "Yatren 105." [**Treatment of Amoebic Dysentery in Adults and Children by Yatren 105.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1926. Apr. 1. Vol. 30. No. 4. pp. 148–157.

Observations on the comparative merits of Yatren 105 and emetine therapy, in a rather small number of cases of amoebic dysentery in adults, infants and small children, occurring in Tiberias, Palestine. Brief clinical notes of typical cases are given.

The author concludes that yatren (per os and per rectum) is preferable to emetine for adults in whom the amoebic dysentery is chronic and resistant to treatment, or in whom there is some other concurrent disease, especially heart disease, or in whom general debilitation is marked. Yatren can also be used (and emetine should not be) for ambulatory treatment of adults. In his experience, emetine is dangerous for infants and small children. He has seen death follow its use in them. Yatren per os (or per rectum) is safe, and its effects so good that when further experience shall have disclosed the best dosage it must entirely supersede emetine for children, just as it has now displaced emetine for all cases of chronic amoebic dysentery in adults.

H. M. H.

RUGE (Reinhold). Tratamiento de la disenteria amibiana. [**Treatment of Amoebic Dysentery.**]—*La Medicina Germano-Hispano-Americana.* 1926. Vol. 3. No. 5. pp. 353–356.

The advantages of yatren 105 in the treatment of amoebic dysentery are highly lauded. It proved serviceable in the author's hands in acute and chronic cases, and amelioration was noticed within 24 hours. The dose is 3 gm. daily in divided doses, in pill-form, and cure rarely needs longer than 8 to 10 days, though it is advisable to give another shorter course of 3 gm. a day for five days after an interval of 3–4 weeks. If desired, yatren may be administered *per rectum*, as an enema of 200–400 cc. of a 2–2½ per cent. solution in warm water. The enema should not be too large as it acts better if retained throughout the night. The drug was also found useful in amoebic hepatitis.

H. Harold Scott.

Bach (F. W.) & Steinhauer (H.). Ueber einen 27 Jahre alten Fall chronischer Amöbenruhr und dessen Heilung durch Yatren sowie Bemerkungen ueber das Vorkommen von Amöbenruhr und die Verbreitung der Ruhr überhaupt in Deutschland. **Case of Chronic Amoebic Dysentery of 27 Years' Duration. Cure by Yatren. Occurrence of Amoebic Dysentery in Germany.** *Münch. Med. Woch.* 1926. May 21. Vol. 73. No. 21. pp. 865–866. [17 refs.]

Dobell has described a case of amoebic dysentery persisting for 16 years, and Huppenbauer one for 17 years. The authors' case had persisted for 27 years. Its interest lies in the fact that after this long infection it was cured by yatren, and also that the long period during which its true nature remained unrecognized has a bearing on the question of the occurrence and spread of amoebic dysentery in Germany. The patient, a man aet. 55 years, contracted dysentery in Alabama in 1898. Many relapses since then. In 1922 carcinoma of intestine was suspected, but operation did not confirm this. In 1925, sigmoidoscopic and microscopic examination, following a severe relapse, revealed amoebic infection. Numerous *minuta* forms were found, and many one, two and four nucleated cysts. Treatment was mainly by yatren per os. Rapid and complete restoration to bodily health resulted and 5 months later cysts and *minuta* forms were still absent from the stools.

With regard to the occurrence of amoebic dysentery in Germany, the authors note that French authors reported the disease in Lorraine and Lorraine, that German cases had occurred recently, apparently infected by contact with individuals who had suffered from "dysentery" in France during the war and at a time when there was no epidemic dysentery. Furthermore, in Germany there are quartered to-day foreign colonial troops.

Fischer in 1919 reported an autochthonous case in Göttingen and others, including the authors, have reported cases since then. Many sporadic cases of dysentery have not in fact been investigated to determine whether they were amoebic or bacillary. Amoebic dysentery can be diagnosed with certainty only by microscopic examination of stools. When this last becomes more general in Germany, it is very probable that amoebic dysentery will be found to be more common.

H. M. H.

[illegible] **Treatment of Amoebic Dysentery by Stovarsol.** [illegible] *Méd. de Yucatán.* 1925. Dec. Vol. 13. No. 10. pp. 141–146.

Details are given of six patients, whose ages ranged between 19 and [illegible] years. The [illegible] was considered to be of the amoebic variety, but on clinical grounds only. Stovarsol, 1 gm. daily at first, 0·75 gm. later, led to rapid amelioration, [illegible] This was [illegible] 22 years of age [illegible] without result. This was then replaced by emetine, which also proved [illegible]ss, so a second course of 5 gm. stovarsol was given, but death followed. [illegible] patient improved so much in 3 days that she did not return for further [illegible]nt till a relapse came on 3 weeks later, when another 3 gm. in [illegible] led to a cure; at all events, there had been no further relapse at [illegible]me of writing. No definite statement is made as to the mode of [illegible]ion; apparently it was taken by mouth.

H. Harold Scott.

VAN DER SPUY (A. J.). **Acriflavine in the Treatment of Chronic Amoebic Dysentery.**—*Jl. Roy. Army Med. Corps.* 1926. June. Vol. 46. No. 6. pp. 424–429.

The author states that at the present time statistics indicate that 20 per cent. of acute cases of amoebic dysentery become "chronic carriers" and potential sources for the outbreak of fresh infection. Eradication of this focus of infection is of primary importance in preventive medicine. He now reports the clinical history of 4 cases.

Case 1. After two attacks of amoebic dysentery, was operated on for large abscess in left hepatic lobe, after emetine injections had failed to improve the patient's condition. The abscess was evacuated and its cavity swabbed with flavine solution (strength unknown), some of which was left in the cavity, and wound closed without drainage. Six months later the patient was still on duty apparently fit.

The other three cases had all suffered from more than one attack of amoebic dysentery for which they had received emetine injections. All were amoebae and cyst carriers. In all appendicostomy was performed and the large intestine washed out through the appendicostomy opening with acriflavine solution, 1/5,000 in water. In two of the cases other lotions, such as protargol and zinc sulphate, were also used for the appendicostomy lavage. All the cases made good recoveries. In two, ten consecutive examinations of the stools revealed no amoebae or cysts.

H. M. H.

ANDERSEN (Albert F. R.). **Amebic Colitis. Its Treatment by Trans-Duodenal Medication.**—*Amer. Jl. Trop. Med.* 1926. Mar. Vol. 6. No. 2. pp. 119–122.

The author states that in amoebic dysentery the active amoebae are protected from destruction by the plugging up of the ulcers with debris. This plug can be removed by the transduodenal enema. Powdered ipecac, given through the tube immediately after the ulcers are cleaned out, can get in its effect where most needed. Emetine given hypodermically may be a useful adjuvant. The technique followed is.—

1. Lacto-farinaceous diet, frequent feedings, for 2 or 3 days preceding, and throughout course of treatment.

2. In the morning, after 12 hours' fast, regulation duodenal tube is passed well into patient's duodenum, its location being determined preferably by X-ray. The tube may have to be passed the night before where much pylorospasm exists.

3. The pylorus is encouraged to close by giving patient 4 or 5 ounces of cold milk to drink alongside the tube.

4. 500 cc. of 10 per cent. aqueous sol. of sod. and mag. sulph. at temperature 105° F. is run slowly through the tube into the duodenum. This produces copious watery evacuation in 20 to 30 minutes, cleaning out ulcer bases very satisfactorily.

5. 20 minutes after giving the hypertonic salt solution, there is poured down tube a suspension of 1 drachm powdered ipecac in 50 cc. plain warm water, followed by 50 cc. plain water to wash out tube. Tube is left *in situ* for 1 hour, as in its withdrawal a little ipecac might be carried into stomach and cause persistent vomiting.

6. 1½ to 2 hours after the ipecac the patient resumes his feedings, which are pushed, even though no appetite be present.

7. These treatments are repeated daily for 7 days, and are followed by an interval of 7 days, and then another 7 days course of treatment.

It is suggested that "this method be given a trial where a careful check-up would be available."

H. M. H.

Jobson (E. W. C.). **Three Cases of Liver Abscess.**—*Kenya Med. Jl.* 1926. May. Vol. 3. No. 2. pp. 55–57.

Case I. *Drainage by transpleural route.*—A tender oedematous swelling over right ribs in anterior axillary line; fever. Exploring needle inserted, 1 inch of 9th rib excised, and large abscess in right lobe of liver opened and drained by rubber tube. Emetine and E.B.I. treatment. Patient reported quite well four months later.

Case 2. *Rupture into lung.*—Two months pain over liver; right shoulder pain; occasional fever. *Emetine injections given, from 18th day after patient came under observation. Eleven days later patient coughed up typical liver abscess pus.* Eventual apparent cure after courses of emetine treatment.

Case 3. *Drainage by abdominal route.*—Painful liver extending 3 finger-breadths below costal margin; fever. Abscess explored and drained through abdomen. Emetine treatment. Four months later patient appeared quite well.

All above three were natives of not more than 30 years of age. Only one emaciated. None gave history of dysentery or diarrhoea.

Notes of 6 other cases in natives are given. Case 6 was a young native under observation for some months during which he progressively lost weight without discovered cause. Diarrhoea five months previously. Pain developed at level of 10th right rib in anterior axillary line. No improvement followed a course of emetine injections. Twelve exploratory punctures of liver failed to find pus. Then second course of emetine was followed by marked gain in weight, loss of pain, and eventual complete recovery. In this case there was arthritis of both knees.

Khan (Matloob). **Two Interesting Cases of Liver Abscess.**—*Indian Med. Gaz.* 1926. Mar. Vol. 61. No. 3. pp. 124–126.

Case I. Large liver abscess. This (perhaps knowledgeable) patient, a Hindu cultivator, aged 46 years, on the fifth day of emetine injections stoutly insisted on some surgical procedure. He did not think, as things were, that he was being properly treated. Accordingly, by hypodermic syringe, 1 cc. only of pus was withdrawn and shown to him. Further aspiration was as stoutly refused by the author, who continued treatment by emetine injections. In all, the patient received 24 injections, 1 grain each subcutaneously, of emetine hydrochloride. 85 days after admission to hospital patient was working in the fields with no sign of liver enlargement and apparently in sound health.

Case II. Hindu girl aged 14 years. Liver abscess bursting into right lung with secondary pneumonia. As her parents refused to allow her to go into hospital, she was brought daily for treatment. She was given daily for 12 days, hypodermically, emetine hydrochlor. gr. 1. A further course was advised, but patient did not attend for it. Improvement followed steadily on the injections. When last seen, on the 74th day after first injection, she was at work and apparently well, but liver was enlarged to 3½ finger-breadths below costal margin and slightly tender on deep pressure.

H. M. H.

PONTANO (Tommaso.) L'ascesso epatico amebico. [**Amoebic Hepatic Abscess.**]—*Policlinico.* Sez. Med. 1926. Apr. 1. Vol. 33. No. 4. pp. 177–202.

This contribution, forming an excellent account of amoebic hepatitis, is divided into several sections dealing successively with the pathogeny, pathological anatomy, clinical symptoms and treatment. The author's opinions may be summed up as follows :—(1) Amoebic abscess of the liver is due to localization of the *E. histolytica via* the portal radicles and should not be regarded as a *complication* of dysentery in all cases. (2) Hepatic abscess is due to definite colliquative necrosis resulting from the presence of the amoeba and not to any pyogenic process analogous to bacterial action, for material removed by puncture shows cellular detritus, not organisms and polymorphonuclear cells. (3) Treatment of the condition is fundamentally medicinal, by emetine, whether the abscess is of recent or remote formation, large or small, whether the general condition of the patient is good or bad. Only if organisms have gained entrance and the necrotic process has become converted into a true purulent one, or if perforation occurs into the peritoneal cavity, are surgical measures called for or justifiable. If the abscess opens into the lung, medicinal means are sufficient. Generally speaking, operation is no more warranted in amoebic abscess than in gumma of the liver.

H. Harold Scott.

MANSON-BAHR (Philip) & MORRIS (R. M.). **Emetine in the Treatment of Hepatic Abscess.**—*Lancet.* 1926. Jan. 9. pp. 69–70. [4 refs.]

The authors note that injections of emetine, when combined with surgical measures, in liver abscess appear to exert a distinct effect in promoting absorption of pus and obliteration of abscess cavity. It is generally conceded that in hepatic amoebiasis emetine is more efficacious in extirpating *E. histolytica* than when this parasite invades the bowel wall.

It has been claimed by some that even without surgical interference, emetine injections can cure amoebic liver abscess and bring about absorption of even large quantities of pus, on the grounds that there is a close analogy between amoebic liver abscess and gumma or tuberculous abscess, and that the first should therefore be treated on similar medical lines.

Clinical records of two cases are given.

Case 1. Liver abscess 7 years after date of presumable infection. The recurrence of a third abscess after two successful operations ; the apparent recovery on emetine treatment without aspiration ; and the eventual demonstration of a large amount of pus in the liver *at a time when all ascertainable signs and symptoms* of liver abscess had disappeared.

Case 2—showed conclusively that emetine injections did not in any way prevent the reaccumulation of pus in the liver abscess cavity. (This case was under Dr. G. C. LOW.)

The authors disclaim any discountenancing of the value of emetine in the treatment of liver abscess, but rather they emphasize that it is only to be used as an adjuvant to the surgical measure of aspiration. The rapid effect of emetine in acute amoebic hepatitis is probably due to its action upon the amoebae themselves, and to its effect was

probably due the fact that, in the two cases reported, no amoebae were found in the pus evacuated from the liver; but there are no grounds for believing that, under ordinary circumstances, emetine in any way hastens or affects absorption of pus already formed within the liver.

H. M. H.

Hodson (V. S.); Manson-Bahr (P. H.); Thurston (E. Owen). **Emetine in the Treatment of Hepatic Abscess.** Correspondence. —*Lancet.* 1926. Mar. 27. pp. 681–682; Apr. 10. p. 784.

Hodson claims that emetine alone is sufficient to cure hepatic abscess. Had the condition been called anything but abscess, and ipecacuanha been properly appreciated as a therapeutic agent, it is very doubtful if surgical interference would ever have reached its recent importance in these cases. In origin the "abscess" is secondary to bowel infection; is not circumscribed; its inner surface is extremely irregular; contents sterile; causative organism in the tissues—in fact, from every point of view exactly analogous to a gumma. Obsession with the pyogenic abscess idea obstructs belief that absorption of contents of "hepatic abscess" is possible; but compare cross section of the myriad lymphatics of liver with that of the aspirating needle.

Aspiration need not be necessary before diagnosis of hepatic abscess. can be made; he has published record of case in which, though unproved by aspiration, the abscess ruptured two hours after treatment was begun. An analogous condition is psoas abscess; aspiration is not here required to establish diagnosis, nor would such a case be classified as unconvincing, if contents were absorbed in course of treatment without aspiration. Aspiration and evacuation of hepatic abscess introduces a definitely deleterious factor, upsetting all natural processes of elimination. So long as amoebae are alive, flow of defence forces is centripetal; once amoebae are killed this become centrifugal, unless contents are forcibly evacuated, when flow remains centripetal, for nature abhors a vacuum. He has demonstrated, and many cases in the literature confirm, that emetine alone suffices to cure liver abscess. Aspiration does not lead to cure in the quickest, most certain and most humane way possible. Abscesses, especially in earlier stages, are often multiple, up to 25 per cent., it has been stated: no one could be sure that all abscesses had been evacuated by the aspirator: so that abscess which escaped the needle has recovered thanks to emetine, which even the most surgically minded use in association with the aspirating needle. Why, then, put patient to pain and inconvenience of aspiration? Why not leave all the duty to nature and emetine?

Finally: (1) Emetine gr. 1 for 12 consecutive days is not the best method of giving the drug in liver abscess cases or for dysentery; (2) the larger the abscess and the longer it has lasted the easier it is to cure with emetine alone.

Manson Bahr replies, agreeing that emetine acts beneficially in liver abscess, and has sometimes appeared to have rendered operative interference unnecessary; but it is extremely difficult to distinguish actual formation of amoebic pus from amoebic hepatitis with liver tissue invaded by entamoebae sine pus formation. Aspiration is the only method capable of settling the matter. The question at stake is the size of the abscess or abscesses, and the results of the absorption of such a large amount of toxic matter on the individual. Usually grave toxaemia is present, and the sooner pus is evacuated

the better for the patient. It is untherapeutic to force an already toxic subject to absorb a large amount of dead liver tissue through his lymphatic channels, when a much more rapid and pleasant method is at hand. Liver abscess may be a comparatively trivial, or a very serious, disease. When a large quantity of pus is formed, respiration is hampered, and heart may be displaced; emetine cannot be credited with such miraculous qualities that a few grains will suffice to dispel several pints of dead tissue and relieve pressure on vital organs; nor can it lessen amount of septic absorption. He cites in support two cases, already reported, where, firstly, emetine failed to prevent recurrence of abscess, and secondly, failed to prevent reaccumulation of pus in abscess already drained (*see* above). It is at present unwise to dogmatize on action of emetine in liver abscess, but to assert that the larger the abscess and the longer it has lasted, the easier it is to cure with emetine, appears to be in direct contradiction to clinical experience.

Thurston had operated on 167 cases of hepatic abscess and seen many others. He agrees that it is possible for contents of hepatic abscesses, large and small, to be absorbed, but that this rarely occurs. Aspiration is necessary for the diagnosis of liver abscess. Aspiration plus emetine does cure in the quickest, the most certain and the most humane way possible, as opposed to emetine alone. It is astonishing what an amount of pus may be found with few physical signs. His experience is against the statement that 25 per cent. of the abscesses are multiple, and also that the larger the abscess the easier it is to cure with emetine alone. He agrees that emetine gr. 1 on 12 consecutive days is not the best way of administering the drug.

H. M. H.

Chand (H.). **A Note on the Treatment of Amoebic Abscess of the Liver.**—*Indian Med. Gaz.* 1926. Feb. Vol. 61. No. 2. pp. 66–67. With 1 chart in text.

The author advocates treatment by aspiration and injections of emetine, instead of open operation, and in support records a case where uninterrupted recovery followed aspiration of 4 pints of chocolate-coloured pus from the liver, and daily emetine hydrochlor. injections of 1 grain for 11 days.

H. M. H.

Petridis (Pavlos Ar.). Un cas d'abcès du foie guéri par le traitement émétinien seul. **Liver Abscess cured by Emetine Alone.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1926. June 3. Year 42. 3rd Ser. Vol. 50. No. 19. pp. 891–894.

Male patient 52 years old. Twelve years previously dysentery with five subsequent repetitions. For a month had suffered from intense pain in epigastrium and right hypochondrium, with fever. Liver found to be enlarged two finger-breadths below costal margin, and tender—acute tenderness in epigastrium. Leucocytes, 8,500, neutrophil polynuclears, 76 per cent. Emetine by injection was followed by rapid disappearance of fever and steady decrease in size of liver, and of pain. On the 29th day after admission to hospital liver normal in extent, no tenderness and patient quite well. The author discusses this case—among obvious considerations he makes the completely critical observation: "There is

one lacuna, the lack of liver puncture, which if positive would have been of great value in estimating the efficacy of the emetine treatment." [The one lacuna makes, in this case, liver abscess not proven.]

H. M. H.

i. PANAYOTATOU (A.). Sur un cas d'amibiase généralisée. **A Case of Generalized Amoebiasis.** —*Bull. Soc. Path. Exot.* 1926. Feb. 10. Vol. 19. No. 2. pp. 88–92. [12 refs.]

ii. ——. Expérimentations biologiques sur le chat, concernant la pathogénie des *amibes des crachats* et des *amibes des urines* d'un meme malade, selon la méthode de Boeck et Drbohlav. **Experiments on the Cat to show the Pathogenicity of Amoebae from the Sputa and Urine of a Patient.** —*Ibid.* pp. 92–95. [4 refs.]

i. A wasted boy aet. 13 years, with dysentery which had lasted off and on for 3 months. Bronchitis signs in chest, large tender liver, spleen not palpable, frequency of micturition. By microscope, stools revealed encysted and active amoebae; sputa, a few cysts and active amoebae containing r.b.c.s; urine, no cysts, but many active amoebae, casts, pus, and red blood cells. Treatment by emetine injections and stovarsol by mouth was followed by rapid and apparently complete recovery. The author claims this to be a case of generalized amoebiasis, the infection beginning in the bowel and spreading throughout the body by blood or lymphatic stream.

ii. From this boy, sputa containing living amoebae were injected into the rectum of cat No. 1, whose anus was then sealed with collodion; 48 hours later collodion was dissolved off, and two or three hours later the cat passed diarrhoeic stools, and on the 3rd day after the injection bloody stools. These stools showed abundant amoebae. The animal died on the 6th day. Autopsy revealed ulcers in the descending colon, and submucous haemorrhages in the whole extent of the large intestine, the walls of which were congested, oedematous, and patched with bloody mucus containing amoebae.

From the same boy urine containing numerous amoebae was inoculated into rectum of cat No. 2, by the same technique. This cat developed mucous diarrhoea showing amoebae and scanty cysts. On the 9th and 10th days the stools became bloody, and on the 11th day the extremely wasted animal died. Autopsy revealed the same condition of the large gut as in cat No. 1—numerous amoebae being found in the mucus.

From the same boy, and by the same method, muco-sanguineous faeces was injected into cat No. 3, producing muco-diarrhoea and later bloody stools, containing many amoebae. The cat wasted and died on the 8th day. Autopsy disclosed the same condition as in cats 1 and 2, once more numerous living amoebae being found in the gut.

These experiments are claimed by the author to show that the amoebae infesting the three different systems in the same patient were all of one species, *Entamoeba histolytica*; and that this parasite can infect different regions of the body and cause either intra or extra intestinal manifestations according to the organ of localization.

H. M. H.

Farmachidis (C. B.). Amebiasi intestinale ed endocardite. [**Intestinal Amoebiasis and Endocarditis.**]—*Policlinico.* Sez. Prat. 1926. June 7. Vol. 33. No. 23. pp. 794–796.

Four cases are recorded, all in women between the ages of 38 and 57 years, who in the course of an attack of amoebic dysentery developed the physical signs of mitral insufficiency. There was no history in any of the patients of any of the usual forerunners of endocarditis. Whether the condition results from focal localization of the amoeba on the endocardium, or is a toxic effect, or, finally, whether the intestinal lesions permit the entrance of some pathogenic micro-organism, is not decided. [Blood-cultures do not seem to have been attempted.]

H. Harold Scott.

van Hoof (L.). Abcès, fistules et ulcères d'origine amibienne. [**Abscess, Fistula, and Ulcers of Amoebic Origin.**]—*Ann. Soc. Belge de Méd. Trop.* 1926. Apr. Vol. 6. No. 1. pp. 45–48. With 1 text fig. [2 refs.]

The patient, a negro woman, mother of three children showing no signs of syphilis, suffered from dysentery in 1915, for which she received injections —probably of emetine. There had been relapses of dysentery since. In July, 1925, the patient presented ulceration of the skin of the buttocks around the anus ; some of these ulcers communicated with the bowel. The uro-genital system was unaffected—inflammation and ulceration being confined to the cellular tissues of the ischiorectal fossae and the skin over them. In the pus of both fistulous ulcers, and those not communicating with rectum, active haematophagous amoebae were found. After a few injections of emetine hydrochlor. amoebae could not be found and rapid healing of the lesions followed.

H. M. H.

Raúl Goyena (Juan). Un caso de amebiasis intestinal y urinaria. [**Case of Intestinal and Urinary Amoebiasis.**]—*Semana Méd.* 1926. May 20. Vol. 33. No. 20 (1688). pp. 1075–1076. [1 ref.]

Though dysenteric amoebae have been reported as being seen in the urine, the cystic form has not. The author therefore places on record the case of a woman of 56 years who had suffered for two years or more with dysentery, 16–18 stools daily during the last five months. In the latter period also there has been lumbar and hypogastric pain, with frequent passage of turbid urine. Vegetative and cystic forms of *E. histolytica* were found in both stools and urine. Emetine was given subcutaneously and " Yatren 105 " by mouth. After 10 days' treatment there was considerable improvement, to 9 stools a day, and though cysts were still present the amoebic form was not seen. The lumbar pain diminished and the urine became clearer, but was found to contain still a few vegetative amoebae and a large number of cystic forms with pus cells.

H. Harold Scott.

Petridis (Pavlos Ar.). Un cas de syndrome pseudo-appendiculaire dysentérique. [**A Case of Dysentery simulating Appendicitis.**] —*Arch. des Malad. de l'Appareil Digestif.* 1925. Dec. Vol. 15. No. 10. pp. 1027–1034.

Description of a case in the Greek Hospital, Alexandria. A male patient, 41 years old, had suffered for two years from vague abdominal derangements; no dysentery. For 45 days he had had abdominal pain and constipation followed by slight diarrhoea. In hospital he was found to have fever, blood stained mucoid stools, and great tenderness in right iliac fossa over McBurney's point. Two emetine injections were given. At operation, to the naked eye and palpation the vermiform appendix and ascending colon appeared normal, the caecum was congested and appeared ulcerated and friable. Appendix removed. Patient died 24 hours later. At autopsy all large intestine and caecum showed ulceration. Microscopic examination revealed entamoebae in the submucous and subperitoneal coats of the caecum and large intestine.

H. M. H.

José Vitox (Juan). **Broncoamibiasis.**—*Semana Méd.* 1925. Dec. 10. Vol. 32. No. 50 (1665). pp. 1465–1467.

Medical practitioners, states the author, are too prone to regard all patients with bloody sputum as tuberculous, and he enumerates other causes for this symptom and particularly *E. histolytica*. A case is narrated of a medical student, 23 years of age, with a troublesome cough, profuse expectoration, loss of appetite and wasting. "There were amoebae in abundance in the expectoration," and the symptoms cleared up after treatment by emetine and salvarsan.

H. Harold Scott.

Paisseau (M.) & Bertrand-Fontaine. Sur un cas d'amibiase bronchique. [**A Case of Bronchial Amoebiasis.**] —*Bull. Soc. Path. Exot.* 1926. Mar. 10. Vol. 19. No. 3. pp. 176–180. [8 refs.]

The symptoms were wasting, cough and copious expectoration of purulent and bloody sputum. Tubercle was suspected, but examination revealed no signs of this in the lungs, and X-rays showed them to be quite clear. Liver, spleen and kidneys normal. Examination of fresh sputum disclosed numerous amoebae, with hyaline ectoplasm clearly marked off from endoplasm, and with inclusions; amoeboid movements. No encysted forms. The authors add that examination after fixation (Bouin) and iron-haematoxylin staining did not permit clear distinction between the amoebae and the leucocytes present. Nevertheless emetine injections were promptly followed by disappearance of all symptoms.

H. M. H.

St John (J. H.). **Practical Value of Examination for *Endameba histolytica* by Culture.** —*Jl. Amer. Med. Assoc.* 1926. Apr. 24. Vol. 86. No. 17. p. 1272. [2 refs.]

Following on Boeck and Drbohlav's successful cultivation of *E. histolytica*, the author has found cultivation of the parasites a valuable aid in managing amoebic dysentery. Thus: *E. histolytica*, which previous microscopic examinations had not revealed, were found by culture in the stools of patients and healthy men; one

stool 48 hours old, containing by microscope cysts of *E. histolytica*, gave, on 24 hours' culture, motile forms. Theoretically, multiplication of amoebas in culture and their settling to the bottom should give at one and the same time the equivalent of examination of a large sample of faeces by one of the concentration methods. Practically, this is exactly what occurs. The cultural method, therefore, is of value for diagnosis in questionable cases, and in treatment control. After studying the parasite in culture the author concludes that the identification of *E. histolytica* can be made accurately on noting its characteristic movements. Large strains usually assume in motion a "band" form, the long diameter being two or more times that of the transverse. The rate of movement is 27·9 microns per minute; slightly less than 1½ inches a day. Any entozoic amoeba obtained from man in culture that moves actively across the field is most probably *E. histolytica*.

Culture methods give to the investigator an opening for more extensive research into the biology of the organisms than has been possible in the past; and to the epidemiologist an effective instrument for the detection of carriers of *E. histolytica*. This method applied to surveys of the population will probably necessitate a revision upward of the incidence of amoebas in man.

H. M. H.

Chiang (S. F.). **Study of Parasitic Amoebae by Experimental Cross Infection of Laboratory Animals.**—*Nat. Med. Jl. China.* 1925. Dec. Vol. 11. No. 6. pp. 440–482. With 31 figs. on 3 plates. [21 refs.]

Cross infection of *E. histolytica* from man to rats was first claimed by Lynch (1915), who fed rats with human faeces containing cysts of *E. histolytica*. His work lacked pathogenic tests, as did Brug's work (1919) in Java, in confirmation of Lynch. Kessel in California (1923) in an extensive investigation confirmed Lynch and Brug's work, but here again there was wanting fundamental biological tests for pathogenicity. Dr. Chiang has successfully infected laboratory-bred, *amoeba-free* young rats with *E. histolytica* from two human sources, introducing the parasites by rectum and by mouth. Biological tests were done by rat inoculation to kittens by rectum. When the kittens were infected they were sacrificed for histological sections. Dr. Chiang describes also a new species of amoeba in rats which he names *Endolimax muris*. This amoeba was found in normal "cultural" rats and closely resembles *Endolimax nana*. He failed to infect laboratory-bred amoeba-free young rats with *E. nana* from man, but succeeded in infecting them with *Endolimax muris* from infected rats. He found rats were normally infected with *Endamoeba histolytica* (*Murina*); *Endamoeba muris*; and *Endolimax muris*. To get amoeba-free young rats for experimental work one must raise them under special care with the combination of high enema examinations. The author's methods to obtain this result, and the careful technique of his experiments and observations are fully described in this paper, which is well illustrated with photomicrographs. He concludes that *E. histolytica* (*Murina*) corresponds closely with *E. histolytica* in man. *E. muris*, of the type *E. coli* in man, morphologically corresponds to the amoeba described by Grassi (1881), Wenyon (1907), and Brug (1919). *Endolimax muris* (new species) corresponds to Endolimax

in man. The results of this investigation give more weight to the evidence incriminating the rat as a carrier of *E. histolytica*, the causal agent of amoebic dysentery, and Dr. Chiang is to be congratulated on a well-planned, carefully executed experimental research, whose value can only be indicated in an abstract.

H. M. H.

Kofoid (Charles A.) & Wagener (Edna Hannibal). **The Behavior of *Endamoeba dysenteriae* in Mixed Cultures with Bacteria.**—*Univ. California Public. Zool.* 1925. Nov. 24. Vol. 28. No. 5. pp. 127–154. With 15 figs. on 3 plates. [14 refs.]

The authors state that probably *Endamoeba dysenteriae* has been successfully cultivated by Boeck (1924) only. They have tried to cultivate *E. dysenteriae*, from acute and chronic human cases of amoebiasis, in order to determine if possible, its optimum medium requirements and the conditions which influence encystment, and to isolate it in pure culture. Full account is given of the technique and media used, and the details of their experimental observations.

They conclude :—

"1. *Endamoeba dysenteriae* has been grown by us in artificial media on repeated occasions from three acute cases of human amoebiasis. The stools of none of these three patients contained *Blastocystis*.

"2. Cultures made from the stools of nine different individuals with chronic amoebiasis and a heavy infection with *Blastocystis* failed to give positive results, apparently because of over-growth by this organism.

"3. For the growth *in vitro* of *E. dysenteriae* either egg or blood is a necessary medium requirement.

"4. *E. dysenteriae* ingests lipoidal substances present in coagulated egg as is shown when these are stained with Sudan III.

"5. *E. dysenteriae* grows better under partial anaerobic conditions than under aerobic conditions.

"6. The presence of blood stimulates more rapid multiplication of *E. dysenteriae* in culture media. Rabbit, guineapig, rat, and cat blood may be substituted for human blood.

"7. Bile does not cause encystment *in vitro*.

"8. No method was found for the isolation of *E. dysenteriae* in pure culture."

Their work is well illustrated by plates showing the types of amoebae from human stool and in cultures.

H. M. H.

Kofoid (Charles A.) & Wagener (Edna Hannibal). **Studies on the Effects of Certain Drugs upon *Endamoeba dysenteriae* in Vitro.**—*Univ. California Public. Zool.* 1925. Nov. 24. Vol. 28. No. 6. pp. 155–166. [4 refs.]

The authors state that the drugs used in these experiments are those recommended in the treatment of amoebiasis, and obviously the results obtained cannot be applied directly to conditions *in vivo* in man. They note that their results indicated that the amoebicidal effect of the drug used depended greatly upon the number of amoebas present in the culture. A second source of deviation would be increase of toxicity of certain arsphenamine compounds because of their rapid oxidation during the experiment. With due regard for these variables,

their results show that the five arsenical compounds are highly amoebicidal. The yatren compounds had very slight effect on *E. dysenteriae in vitro*. The drug in each case was added in graded dilutions to cultures of *Endamoeba dysenteriae* in egg-Locke-blood medium. The lethal dilutions of these drugs in cultures, at the end of 24 hours, were :—

	Dilution		Dilution.
Emetin hydrochloride	1–10,000	Neo-arsphenamine ...	1–142,000
Acetylarsan	1–10,000	Arsphenamine ...	1–100,000
Stovarsol	1–95,142	Sulph-arsphenamine	1–3,330
Yatren purissium ...	1–1,250	Mercurochrome ...	1–11,100
Yatren casein ...	1–250		

In cultures containing the lowest dilution of a drug in which *E. dysenteriae* persisted, the amoebas were highly vacuolated, and had failed to divide. Such amoebas were two or three times their normal size and were moribund.

H. M. H.

Dobell (Clifford) & Laidlaw (P. P.). **The Action of Ipecacuanha Alkaloids on *Entamoeba histolytica* and some other Entozoic Amoebae in Culture.**—*Parasitology*. 1926. June. Vol. 18. No. 2. pp. 206–223. [9 refs.]

It is accepted that emetine is a specific therapeutic agent in amoebic dysentery ; but it is not clear how cure is effected. Dale and Dobell (1917) found that *histolytica* infection usually curable in man was incurable by emetine in the cat, though the same strain of amoeba infected both.

Hitherto conclusions regarding the action of emetine on *E. histolytica* have been based on the results of an imperfect technique ; the length of survival of the parasites outside the body was, until recently, a few hours only and exposure of amoebae to the direct action of emetine was unavoidably short. When the results of such *in vitro* experiments were then compared with the effects of therapeutic action spread over many days it was not surprising that disagreement appeared. The authors were able to get rich cultures of amoebae growing with great regularity and thus to expose the amoebae to various concentrations of ipecac. alkaloids for as long as desired, while their control cultures, without alkaloid, would multiply throughout the course of the experiments. Great care was taken to have in each instance a pure culture of amoebae, though bacteria were always present. Throughout this study the solid constituent, of medium, was inspissated horse serum, and the liquid, egg-white or horse-serum diluted with Ringer's fluid. To a known volume of liquid were added dissolved and measured quantities of the alkaloid to be tested. After thorough mixing and warming to body temperature the tubes were inoculated with the amoebae and incubated at 37° C. for two to three days. As a rule, results at the end of 48 hours were decisive.

The experiments made it clear that 1,50,000 is the highest concentration of emetine that *E. histolytica* will tolerate for more than a short time. They might live and move actively for many hours in 1 1,000 concentration of emetine, but they did not multiply and the cultures soon died out. In 1,200,000 they grew well and multiplied as actively as in the control tubes. The threshold value of emetine was therefore

1 50,000 dilution. In more dilute solutions growth of *E. histolytica* was the rule, in greater concentration death always occurred. Cephaeline was found to be definitely more toxic than emetine for *E. histolytica*. These are the only two alkaloids of ipecac. which have been shown clinically to have curative effect on patients suffering from amoebic dysentery. The other ipecacuanha alkaloids and derivatives, though fairly close chemical relatives, are without action as therapeutic remedies and all in concentrations lower than 1 1,000 invariably gave cultures as rich as the controls.

Quinine, though clinically inactive, was found by Dale and Dobell (1917) to be as lethal in high concentrations *in vitro* as emetine. Tested now by this new technique, quinine in concentration lower than 1 1,000 gave cultures of *histolytica* as rich as in the controls. Stovarsol was found to be without effect in dilutions of 1 20,000 or less; but had a slow poisonous action in stronger solutions. Thus in 1/1,000, *E. histolytica* were all killed in three days; in 1 5,000 a very few survived for four days; while in 1 10,000 there was slower and less evident action. Under these experimental conditions, emetine is shown to be ten times more toxic than stovarsol for *E. histolytica*. Similar comparisons showed that, *in vitro*, emetine and cephaeline were fifty times more toxic to *E. histolytica* than were any of the other ipecac. alkaloids. All these results held good for simian as well as for human strains. There thus appears to be a close parallel between the actions of the various ipecac. alkaloids on cultures of *E. histolytica in vitro* and their therapeutic effects in human infections therewith.

E. histolytica, however, stands alone in its susceptibility to emetine. In a mixed infection of *histolytica* and *E. coli*, emetine will eradicate the former and leave the latter unaffected. *In vitro E. coli* in 1/500 emetine solution gave growth in culture equal to the controls.

Endolimax nana grew in 1 25,000 emetine but not in higher concentrations. *Entamoeba gingivalis* was more sensitive to emetine than were *nana* and *coli* but considerably less so than was *histolytica*. When *Entamoeba histolytica* and *Endolimax nana* were grown side by side, the *histolytica* ultimately became dominant. A mixed culture of these two parasites was inoculated into a tube containing 1 25,000 emetine and subcultured at intervals of two days' time; *nana* alone developed. It was thus separated from *histolytica* by the specific lethal action of emetine on the latter, *in vitro*. There is here, again, a close parallel with what happens *in vivo*, for emetine will not eradicate a human infection with *Endolimax nana*, *Entamoeba coli* and *E. gingivalis*.

The authors consider that their experiments demonstrate that doses of emetine and other alkaloids requisite to kill *E. histolytica* immediately bear no apparent relation to the minimal doses of the same substances which are eventually lethal if maintained for a period of days. How weak solutions of emetine act on *E. histolytica* is difficult to determine. Experiments showed that it did not, even after a considerable time, impair permanently the reproductive powers of *E. histolytica* and that its action could not be due to any effect it might have on the bacteria growing with the amoebae.

Dale and Dobell found that emetine 1 10,000 did not make *E. histolytica* non infective. The poisoning process, whatever it be, is slow, producing its ultimate effect in a concentration far below that required to kill the parasites immediately. A very small amount of emetine if constantly present in the intestine for days or weeks would probably suffice to make life therein impossible for *E. histolytica* though not for *E. coli*.

The experiments of Sellards & Levia (1923) and Dale & Dobell, together show that there is a real difference between cat and man in reaction to emetine. Dobell and Laidlaw think that man and cat deal with the alkaloid in different ways; that in the cat most of the emetine is rapidly excreted in the urine, while in man it is, at least in part, excreted into the intestines.

Some human beings infected with *E. histolytica* appear to be incurable by emetine however administered. To explain this the existence of emetine-resistant strains of the parasite has been postulated, but the authors found it impossible experimentally to obtain or produce a strain of *E. histolytica* resistant to emetine. They suggest that the incurability of these cases may be due to the fact that they, like the cat, excrete the drug rapidly in the urine, so that little or none of it reaches the colon. Comparative analyses of urine in different cases would settle the matter. They conclude finally that the curative effects of emetine in human amoebic dysentery are best explained as a result of the *direct lethal action* of the alkaloid on *E. histolytica*. The authors point out that, as with amoebae, so with trypanosomes and spirochaetes, it is not sufficient to expose parasites to a given drug for a few minutes or a few hours, or to ascertain what concentration of the drug is instantaneously fatal. Before the possibility of direct action can be excluded, the effects of prolonged exposure to weaker concentrations must be determined.

[The clinician will note, however, that these are conclusions based mainly on results of *in vitro* experiments; that a highly "organic" medium was in fact incubated with the drug tested; and most of all will he think of the "magic" (because very rapid) result of one or two gr.½ injections of emetine in many of his severe cases of amoebic dysentery, and question if in so short a time and with so few doses a concentration of emetine greater than 1 50,000 has appeared in the colon. If this indeed be so, then its direct lethal action on the parasites in the colon must be a far more rapid one than in the experimenter's test tube.]

H. M. H.

Kessel (John F. & Hegner, Robert). **The Effect of an Exclusive Milk Diet on Intestinal Amoebae.** *Proc. Soc. Experim. Biol. & Med.* 1926. Feb. Vol. 23. No. 5. pp. 388–391. [6 refs.]

Kessel, working with culture rats, noted that amoeba positive rats fed on exclusive milk diet for two weeks, and then autopsied, were found to be amoeba negative. Rettger, Cheplin, Cannon, McNease have shown that a milk diet changes the flora of rats from predominant *B. coli* type to predominant *B. acidophilus* type. Hegner found an exclusive milk diet to be disadvantageous for the growth of Giardia, Trichomonas and Hexamitus in rats.

In the work on monkeys and children here recorded, the authors used Kessel's technique (iodine-eosin and iron haematoxylin) for examining the stools. Gram stains also were made before and during the milk feeding, and after conclusion of the experiment. Stools of the monkeys and children were examined on six or more days before starting milk diet and daily during and two weeks after the last day of milk-feeding, and again two and three months after the last day of milk—six or more daily examinations at each follow-up period. Two monkeys and two children with amoebae in stools were kept

in each experiment as controls, and in each instance amoebae appeared in their stools throughout the period of the experiment. Tabulation of results brings out the following points :—

i. *Boiled milk fed to monkeys for two weeks.*—Reduction, and in some cases, disappearance of amoebae during boiled milk feeding period, but amoebae were found again two weeks after cessation of milk diet.

ii. *Unboiled milk fed to five monkeys for two weeks.*—3 became permanently negative for *E. dysenteriae*, all 5 for *E. coli*, 2 for *Endolimax*, 4 for Iodamoeba, and 2 for Chilomastix.

iii. *Unboiled milk fed to children for ten days.*—3 children heavily positive for amoebae, but showing no important clinical symptoms were placed on exclusive milk diet for 10 consecutive days. One child was completely rid of the amoebic infection, after the period of milk diet and up to 3 months later. Another was rid of *E. dysenteriae* only, and another of *Endolimax nana* only.

As with the monkeys, flagellates in the children's stools did not respond so readily to the milk diet as did the amoebae.

The authors conclude that this diet cannot be recommended as a therapeutic measure, since the results are so uncertain ; the diet is inadequate and, to some, offensive ; and the dangers of infection in feeding raw milk considerable.

H. M. H

Guérin (F. H.) & Pons (R.). Culture de *Blastocystis hominis* et des protozoaires parasites intestinaux de l'homme. [**Culture of *Blastocystis hominis* and Intestinal Protozoa of Man.** *Arch. Inst. Pasteur d'Indochine.* 1925. Oct. No. 2. pp. 213–221. With 2 figs. on 1 plate. [31 refs.]

The author's modification of culture of *Entamoeba histolytica* is here fully described. The culture medium consists of Dorset medium in which the distilled water is replaced by a 2 per cent. solution of egg-albumin. After coagulation in a suitable tube at an angle of 45°, this is covered as far as the middle with a solution consisting of 10 gm. sodium chloride. 0·9 gm. potassium, 0·2 gm. calcium, 0·1 gm. sodium bicarbonate, and 1 gm. glucose per 1,000 gm. of distilled water. The upper slope of the Dorset medium is inseminated with the sanguinolent mucus, and the whole then flooded with albuminized Ringer solution and incubated at 37° C. In this manner the authors have also cultivated *Blastocystis hominis*, *Enteromonas hominis*, and *Trichomonas intestinalis*, but not Giardia.

A. A.

K[illegible] (Charles A.) & Wagner (Edith Hamond). **A Simplified Medium for the Cultivation of *Endameba dysenteriae*.**—*Jl. Lab. & Clin. Med.* 1926. Apr. Vol. 11. No. 7. p. 683. [1 ref.]

The authors, referring to the methods of Boeck and Drbohlav for cultivating the dysentery amoeba, find, as a medium less favourable to bacteria, one made by covering the egg-slant with 10 cc. of Locke's solution containing 0·5 per cent. of defibrinated rabbit-blood (or rat, cat, or guineapig blood). "It is necessary to transplant the cultures every 48 hours in order to keep them going continuously."

A. A.

i. Reichenow (Eduard). Neuere Forschungen ueber die Darmamöben des Menschen. Kritisches Sammelreferat. [**Recent Work on the Intestinal Amoebae of Man.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1926. May 1. Vol. 30. No. 5. pp. 207–221. [55 refs.]

ii. Hopkin (V. S.). **Emetine in the Treatment of Hepatic Abscess.** [Correspondence.]—*Lancet.* 1926. May 29. pp. 1063–1064.

iii. Thomson (J. G.) & Lucas (Catherine L. T.). **A Preliminary Note on the Study of *Endamoeba blatta* Butschli, 1878) Leidy, 1879, found parasitic in the Intestine of *Blatta orientalis* in England, with some Remarks on its Generic Status.**—*Jl. Trop. Med. & Hyg.* 1926. Feb. 1. Vol. 29. No. 3. pp. 41–43. With 5 figs. on 1 plate. [26 refs.]

iv. Barrett (Harvey P.) & Smith (Nannie M.). **The Cultivation of *Endamoeba ranarum*.**—*Ann. Trop. Med. & Parasit.* 1926. Feb. 11. Vol. 20. No. 1. pp. 85–88. [16 refs.]

v. Taliaferro (W. H.) & Fisher (Anna B.). **The Morphology of Motile and Encysted *Endomaeba ranarum* in Culture.**—*Ibid.* pp. 89–96. With 14 figs. on 1 plate. [16 refs.]

vi. Ikeda (T.). **On a Streptothrix found in a Liver Abscess.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1926. Mar. No. 252. English summary p. 4. [In Japanese.]

i. A critical review of fifty-five papers on intestinal amoebae published 1922 to 1926. These have already received notice in this *Bulletin*.

ii. To rely on aspiration and emetine—in that order—is to over-estimate the effect of aspiration and under-value that of emetine.

H. M. H.

iii. This is a good descriptive and well-illustrated paper, and will be useful to those who hold the view that the study of medical protozoology should begin upon the "parasites" (to use that term in its most general sense) of common, cosmopolitan, familiar animals.

iv. Notes the successful cultivation of *Entamoeba ranarum* in a medium of 1 part human serum and 9 parts 0·5 per cent. salt solution, with pH 7 to 8 as the most favourable reaction.

v. In agreement with all recent investigation this, too, emphasizes the similarity in structure of *E. ranarum* and *E. histolytica*.

A. A.

vi. The English summary of this paper, from Formosa, is as follows :—"After operation of a patient suffering from liver abscess, the author examined the pus taken from the abscess by anaërobic culture and found a Streptothrix. The abscess must have been caused by this germ, because no other purulent bacilli except this could be found in the suppurative focus in the liver and also because the patient recovered about one month after operation. Author describes here the nature of this germ."

A. G. B.

Bacillary Dysentery.

Mukherji (Santosh Kumar). **Bacillary Dysentery.**—*Indian Med. Rec.* 1926. May. Vol. 46. No. 5. pp. 135–144. With 2 text figs.

An essay presenting concisely and clearly the known facts of bacillary dysentery, its treatment and prevention. The author notes that the ancient Hindu physicians differentiated dysentery from diarrhoea. Bacillary is the commonest type in India. Acton and Knowles give 90 per cent. of dysentery in Calcutta as bacillary –the author's

own experience in Calcutta gives 70 per cent. An excellent, well illustrated synopsis is given of the microscopic characters of the bacillary dysentery stool —an all important matter in diagnosis. The cellular exudate shows preponderance of polymorphonuclear leucocytes and presence of ghost cells, and large endothelial macrophage cells containing red blood cells. The data for diagnosis of bacillary and amoebic dysentery are given side by side in tabular form. He notes that most failures of serum treatment are due to insufficient dosage or delayed administration. Antidysenteric serum is less toxic than antidiphtheritic or antitetanic serum. Prophylaxis—isolation of patient, anti-fly measures, care of milk and water supply, treatment of carriers, vaccination.

H. M. H.

Wiskowski (S. W.). Zur Frage ueber Mechanismus des Kollapses bei der bazilleren Dysenterie. **Mechanism of Collapse in Bacillary Dysentery.**]—*Jl. Med. de l'Asie Centrale.* Tashkent. 1926. Vol. 5. No. 3. German summary pp. 193–194. [In Russian. Nos. 2 & 3. pp. 80–86; 141–146. With 4 charts in text. 30 refs.]

In consequence of its complexity, bacillary dysentery toxin has differing actions on the human organism and on lower animals respectively. There are two (according to Horimi, four) different poisons. The exotoxin affects especially the splanchnic nerves. Observations on 100 cases in human beings showed death in 36 with characteristic symptoms of collapse. The patient suddenly becomes worse; the temperature subnormal, extremities cold; skin and lips pale as from great loss of blood; pulse is slow, of low pressure, regular; cardiac boundaries not enlarged; heart sounds audible; there is characteristic shortening of the interval between first and second sounds, the first louder than the second. At onset of collapse the blood pressure falls to 5–10 mm. Hg.—and may be unmeasurable. In adults collapse lasts longer, and may be repeated. In aged patients the blood pressure falls very suddenly and collapse lasts much longer.

Autopsy. The cadaver is very pale. The blood vessels in abdomen are much engorged. The heart is contracted, left ventricle usually empty. Heart muscle is only slightly degenerated, and there is no oedema of lungs. The colon and small intestine show very little change.

The author considers death to be caused by the dysentery toxin paralysing the splanchnic nerves, and producing blood stasis in the abdominal vessels. In the acute stage of the illness the heart and peripheral blood vessels are little affected. The condition of the patient is worsened by the derangement of heat regulation and production.

H. M. H.

Pacheco (Genesio). [In Portuguese and English.] A dysenteria bacillar na cidade da Bahia. **Bacillary Dysentery in the City of Bahia.**—*Mem. Inst. Oswaldo Cruz.* 1925. Vol. 18. No. 1. In Portuguese pp. 5–41. With 10 charts in text. In English pp. 43–79. With 10 charts in text.

The author remarks that, endemic or epidemic all over the world, dysentery does not spare Brazil. Its existence had already been

made sure in Rio de Janeiro, Sao Paulo, Bello Horizonte and in the Hinterland of Minas Geraes. His work on the epidemic in Bahia, 1923-24, first bacteriologically proved the existence of bacillary dysentery in that city, although the disease there must date from far back, for the sanitary records of the city give 60 deaths from dysentery in 1897, and since then there have been considerable epidemics, like that of 1908, with 479 deaths. Most of these must have been due to bacillary dysentery, for amoebic is rare. In the 1924 epidemic his investigation revealed not a single case of amoebic dysentery. The mortality, moreover, was high. The bacilli isolated were Shiga and Y types; the former providing the severer cases and higher mortality. It was also the prevailing organism amongst the indigent uncleanly patients; the Y-type prevailing amongst the better class of patient. The epidemic was not water-borne; though water probably played a small part, its spread was mainly due to direct contamination of food and drink by careless or dirty, infected, poverty-stricken people. The paper contains careful reports on the epidemiology and bacteriology of the epidemic, with tables and graphs.

H. M. H.

Hoshi (N.). Ueber Saeuglings-Dysenterie im Orient. [**Infantile Dysentery in the East.** —*Oriental Jl. Diseases of Infants.* Kyoto. 1926. Jan. Vol. 1. No. 1. German summary pp. 41–42. [In Japanese.]

During the last four years the author investigated bacteriologically 164 cases of dysentery in children at Darien Hospital. Fifty-four were infants under 1 year, in 33 per cent. of whom the dysentery bacillus was isolated.

Among all cases he found Y-type to be commonest —35 per cent.; Flexner-type, 25 per cent.; Hiss-type, 12 per cent.; Strong-type, 9 per cent., and Shiga-type, 6 per cent. Serum-agglutination was found less often in infants than in older children. Complement-fixation reaction was positive in 86 per cent. Toxicity for infants ran parallel with toxicity for mice; it was strongest with Shiga-type, next came Flexner and least toxic was Strong-type. Infantile dysentery was most frequent in summer, 74 per cent. of cases; then, in order of frequency of cases, autumn, spring, winter. Older children were more often infected than younger ones; Shiga-type was not found in children under 1 year of age. All children suffering from dysentery were artificially fed; 60 per cent. were boys and 40 per cent. girls. Fever was frequently noted. Toxaemia occurred in 65 per cent. of cases; it was most marked in Flexner- and Shiga-types. Flexner-type produced the more severe local reactions—85 per cent. tenesmus, 64 per cent. acetonuria. Most cases were cured in 3 to 4 weeks, mild cases in 2 to 3, and severe cases in 5 to 6 weeks.

H. M. H.

Hoshi (Naotoshi). **On the Fever and Bacillus Type of Dysentery and Ekiri in Children in Manchuria.** – *Jl. Oriental Med.* 1926. Mar. Vol. 4. No. 3. English summary pp. 64–65. [In Japanese.]

In Manchuria dysentery occurs frequently during the summer months. At Dairen Hospital Children's Clinic in the last 4 years there

have been 525 cases of dysentery, "ekiri," and enteritis, inclusive. 266 cases were proved to be bacillary dysentery. Among these children with dysentery five types of fever were noted.

1. A-type. Temperature rose suddenly, then gradually fell in about 3 days with restoration to health. 27·7 per cent.
2. B-type. Temperature rose suddenly falling in about 3 days, but fever was repeated for 5 or 6 days, and then became normal. 32·3 per cent.
3. C-type. Continued temperature. 30·3 per cent.
4. D-type. Irregular temperature. 6·5 per cent.
5. E-type. No fever. 3·2 per cent.

Using Shiga's classification of the bacillus, by agglutination tests, into types I, II, III, IV, and V—in the A fever type of case none were infected with Shiga's bacillus type I. Shiga II and III were found in 36 per cent. A fever type, 34 per cent. B, and 30 per cent. C types. Shiga IV and V were found in 46 per cent. B, 33 per cent. A, 21 per cent. C. Y-bacillus (classified by sugar fermentation) was found in 52 per cent. B, 38 per cent. A, and 8·7 per cent. C. Flexner bacillus was found in 38 per cent. B, 33·3 per cent. C, 27·4 per cent. A. Clinically cases of A-type fever were not of a serious nature. B-type cases were moderately severe, and C-type more severe, and D-type usually fatal. The first acme of temperature in B-type is thought to be a sign of intoxication, and the second acme to be due to some intestinal cause.

H. M. H.

Yoshitomi (K.). Kinder Dysenterie verursacht durch Mischinfektion von Y-Typus Dysenterie Bacillus und *Mikrokokkus tetragenus aureus*. **Child Dysentery caused by Mixed Infection with Y-Bacillus and** *M. tetragenus aureus*. *Oriental Jl. Diseases of Infants.* Kyoto. 1926. Jan. Vol. 1. No. 1. German summary pp. 39–40. With 2 figs. [In Japanese.]

In the Orient dysentery in children is seldom caused by Shiga bacillus. At the clinic for children, Darien Hospital, in the last 4 years, 132 cases of dysentery were caused by Flexner and Y-type bacilli, and 32 only by Shiga-type.

The author investigated a case in a boy aged 3 years and 2 months. The patient had high fever, moderate toxic and severe dysenteric symptoms. From the 10th to the 16th day of illness the author isolated a *Micrococcus tetragenus aureus* in pure culture. Intraperitoneal injection of this organism into mice and guineapigs produced septicaemia and death. Subcutaneous injection of the coccus caused local inflammation and set up a diarrhoea. These cocci were infective for human beings producing inflammation of the gut with characteristic yellowish purulent stools and remittent fever. The cocci are always in fours enclosed in a thick capsule. They are Gram positive. In nutrient media they produce a fine yellow pigment and the capsule dwindles. They gradually liquefy gelatine. They do not coagulate milk nor split carbohydrates in culture. If artificial culture cause change in character, reversion to type follows on passage through animals or culture in serum or blood bouillon. From this case a Y-type dysentery bacillus [illegible] was also isolated. Two plates in colour illustrate respectively the ochre yellow growth of the micrococcus on media and the yellow purulent stool.

H. M. H.

Brokman (H.) & Przesmycki (F.). **Experiments on the Sensitivity of the Human Skin to the Toxin of the Bacillus of Shiga-Kruse.**—*Jl. of Immunology.* 1926. May. Vol. 11. No. 5. pp. 361–370. [1 ref.]

The discovery by Schick of the cutaneous test for susceptibility or immunity to diphtheria naturally suggested the possibility of using a similar procedure in other bacterial diseases. Brokman (1922) described a cutaneous reaction obtained with culture products of dysentery bacillus and called attention to the skin as a general indicator of immunity [see this *Bulletin*, Vol. 21, pp. 37, 352, 690]. The work of the Dicks (1924) on skin tests in scarlet fever revived interest in the subject. It was known that Shiga bacillus produced a true toxin, and that there were individual differences with respect to injection of toxin in animals and infection in human beings. The technique and nature of the skin reaction with dysentery toxin have been already described in Polish journals and in a communication to the League of Nations. The authors now describe further experiments on this subject. These indicate that the cutaneous reactions obtained with the test fluid from Shiga-Kruse bacillus depend upon a true toxin in it and the absence of reaction proves the lack of susceptibility of the skin to that toxin, and, further, that *if sufficient antitoxin is artificially introduced into the individual, a previous positive reaction becomes negative*—a result identical with that in individuals naturally insensitive. The antitoxin content of the blood, therefore, causes the negative reaction. This antitoxin is specific, and, as in the case of natural immunity to diphtheria, it appears spontaneously in the individual, without a previous attack of the disease or artificial immunization. If this presence of dysenteric antitoxin in human beings provides an actual immunity against infection with dysentery, then the way must be open to attempt an active immunity in the same way as is done for diphtheria and scarlet fever. The authors have begun this attempt with dysentery anatoxin with results to be communicated later.

H. M. H.

de Bellard (E. P.). La disenteria bacilar. Breve nota sobre su tratamiento. [**Treatment of Bacillary Dysentery by Castor Oil.**]—*Gac. Med. de Caracas.* 1925. July 15. Vol. 32. No. 13. pp. 196–197.

The author presents a brief note on the treatment of three cases of bacillary dysentery by castor oil. The initial dose is 60 cc., or a little less if the patient is very weak and in a critical state. During the second and third days he gives 4 cc. every hour, none being given during the night. If this course has not cured, the doses are repeated during the fourth to the sixth days. Symptoms completely disappeared in 10 to 12 days. [See Boase, A. J., *ante*, p. 379.]

H. Harold Scott.

Manson-Bahr (Philip) & Gregg (A. L.). **The Surgical Treatment of Chronic Bacillary Dysentery.**—*Brit. Jl. Surgery.* 1926. Apr. Vol. 13. No. 52. pp. 701–714. With 9 text figs.

Chronic bacillary dysentery is distressing, intractable and too often, in England, unrecognized, and so receives no serious attention.

Crombie first described it—*Morbus bengalensis*—in India. It is a sequel to chronic ulceration of mucous membrane of the large intestine by Flexner Y-group bacilli; rarely by Shiga bacillus. Symptoms and complications, medical and surgical treatment of the condition, are clearly and concisely described. Pictorial representation is given of the essential morbid histology of the gut lesions in its early and later stages.

(1) Ulcerative necrosis of the mucous membrane only, the muscularis mucosae remaining intact. These ulcers are usually found on the free edges of the transverse folds of mucous membrane at the flexures of the large bowel and, in contrast to amoebic ulcers, their outlines are serpiginous, the edges are undermined, and they often intercommunicate with near-by lesions.

(2) Mucous retention cysts in the submucosa, in which virulent dysentery bacilli may be found. These cases usually become "convalescent carriers, *and assist in the spread of the infection.*"

(3) Later extension of the ulceration over the whole mucous surface, infection by faecal organisms and formation of exuberant, even polypoid excrescences of granulation tissue with fibrosis of the bowel wall. This process usually affects the pelvic and sigmoid colon. Inflammation may extend to the peritoneal coat.

(4) Tuberculosis of muscular coat of large intestine secondary to bacillary dysentery. They summarize their conclusions:—

"1. Bacillary dysentery of a mild type may result in a progressive and chronic ulceration of the large bowel in which the specific dysentery bacillus plays but the initial rôle.

"2. The resulting condition is usually not amenable to medical treatment, and life may be preserved only by surgical intervention.

"3. Indications for operation lie in the persistance of toxaemia and loss of weight in spite of colonic lavage.

"4. Appendicostomy may be performed as a measure of relief, but caecostomy may be required.

"5. Caecostomy with the use of the tampon-tube supplants ileostomy except in cases in which the small bowel is involved.

"6. The question of closure is a matter for careful consideration in each case; temporary closure with dressings assists the operator in making his decision.

"7. Stenosis of the bowel to any serious extent is rare, and when it does occur is likely to be localized, so that excision may be practicable.

"8. Tuberculous infection may be superimposed upon a chronic ulcerated dysenteric bowel."

The authors regard as a serious danger the engrafting of tuberculous infection on to a chronic bacillary dysenteric condition of the large intestine. In three cases they had been able to demonstrate the tubercle bacilli in sigmoidoscopic scrapings of the bowel wall.

This paper is truly adorned, and its value enhanced, by drawings and coloured plates from the pen and brush of Dr. Manson-Bahr. They are well chosen and illustrate convincingly the pathology of the lesions described. They deserve mention for themselves alone, and as a lesson for these times, when the custom grows of cluttering up morbid anatomy descriptions with micro-photographic "illustrations" that very seldom illustrate, and never adorn.]

H. M. H.

Morishima (Kan-Ichiro). **Experimental Inquiry into the Constancy of Types of** *Bacillus dysenteriae.*—*Philippine Jl. Sci.* 1926. Apr. Vol. 29. No. 4. pp. 447–463. With 1 plate. [4 refs.]

The Shiga-Kruse dysentery group is fairly uniform and constant. The second main group of mannite fermenters is a variable one, and has several subgroups. These mannite fermenters, when plated on dextrin agar plates, showed development of two types of colony, one regular and transparent, the other irregular and opaque. The opaque colonies of an original Y-strain give acid production in 1 per cent. maltose and in dextrin broths, whereas the regular and transparent colonies produced acid only occasionally after 3 weeks or longer incubation. It was found that the transparent colonies of the original type organisms gave rise to the two types, transparent and opaque, but the reverse was not the case. For serological tests monovalent sera were obtained from rabbits immunized against strains of opaque colony and transparent colony respectively. These sera had about the same power to agglutinate either the opaque type or the transparent type of colony ; that is to say, these colonies could not be differentiated by agglutination test. In adsorption trials, however, all transparent colonies adsorbed agglutinins present in the corresponding immune serum both for the transparent and for the opaque colonies. On the other hand, none of the opaque colonies adsorbed agglutinins for the transparent colonies.

According to the author, the experiments, as far as they go, point to the conclusions that :—

(1) The Shiga-Kruse group is stable.

(2) There is considerable variability in the mannite fermenting group, but all its subgroups should be considered as more or less interchangeable variants. W. F. Harvey.

Vincent (H.). Sur les cultures croisées des bacilles dysentériques. **Crossed Cultures of Dysentery Bacilli.**—*C.R. Soc. Biol.* 1926. Feb. 26. Vol. 94. No. 7. pp. 435–437. [2 refs.]

The author investigates the effect which previous growth of one race of dysentery bacilli in a medium has upon the subsequent growth of another race in it. Bouillon cultures, of 4 days and of 11 days, of each of the types Shiga, Flexner, Hiss, Strong & Saigon were centrifuged at high speed. The supernatant fluid in each case was sown with each of the other types and incubated for growth. The bouillon in which the Shiga type had grown sufficed for the cultivation of all the other dysentery bacilli. The Flexner type inhibited the growth of some strains of Shiga, while Hiss and Strong bacilli were the most antagonistic to subsequent growth of other races. W. F. H.

Mertens (W. K.) & Rademaker (G. A.). Iets over bacillaire dysenterie en de agglutinatie daarbij. [**Notes on Agglutination in Bacillary Dysentery.**]—*Nederl. Tijdschr. v. Geneesk.* 1926. Mar. 20. 70th Year. 1st Half. No. 12. pp. 1190–1195. [8 refs.]

The authors discuss the value of the agglutination test in dysentery and lay stress upon the need for caution in accepting its findings, for the reasons that :—

(1) Agglutination may be absent in chronic dysentery. (2) Normal human sera and normal rabbit sera may give high agglutination titres

with the atoxic dysentery bacilli. (3) Inoculations against typhoid fever and cholera will raise the titre of the individual's serum to dysentery bacilli.

The authors agree with other observers that agglutination by the patient's serum up to 1 in 800 should be discounted in establishing a diagnosis and they recommend the use of immune sera of the highest possible titre for the identification of dysentery organisms from the stools.

At the same time, a serological test is valuable in dysentery if care be exercised, a number of strains be used, and controls be sufficient.

Details, both clinical and bacteriological, are given of two cases.

W. F. H.

Kondo (Seigo). Weitere Untersuchungen ueber die Auswertung der antitoxischen Dysenteriesera am Kaninchen. [**Use of Rabbits for Standardization of Dysentery Sera.**] *Med. Klin.* 1926. May 14. Vol. 22. No. 20 (1118). pp. 775–776. [7 refs.]

Ordinarily mice are used for testing antidysentery sera. The author employs the usual method of evaluation with an L+ dose of toxin. As toxins, he had available German test toxin; dried "wash water" toxin; and "whole" toxin; and as standard sera the dried German serum; the fluid English serum C950; the dried Polish serum; and the dried Japanese serum 128. The test dose of toxin per kilogm. of living weight used in his rabbit experiments was 4 times that found for white mice. The sera were used in a series of appropriate graduated doses and the mixture of serum and toxin was left for 30 min. at room temperature before intravenous injection.

The results obtained in rabbits, in spite of undoubtedly greater liability to variation, corresponded closely to those obtainable with mice. Other workers had found with mice that the relative antitoxin content of English, German, Polish and Japanese sera was as 1 : 3 : 12.5 : 45, while the author finds this with his rabbits to be 1 : 3 : 15 : 45.

His conclusion is that rabbits can be used for the measurement of the potency of dysentery serums, but that, considering the liability to occurrence of a great range of susceptibility in these animals and their greater cost, mice are to be preferred for this purpose.

W. F. H.

Fukuhara (Yoshimoto). Zur Wertbemessung des antitoxischen Dysenterieheilserums. [**Evaluation of the Antitoxic Curative Serum of Dysentery.**] *Ztschr. f. Immunitätsf. u. Experim. Therap.* 1926. Feb. 20. Vol. 46. No. 3. pp. 234–237.

The unit of measurement adopted by the author is that quantity of antitoxic serum capable of completely neutralizing 100 minimal lethal doses of a given toxin. The L+ dose of a testing toxin is measured by this unit and the value of a serum, whose potency is to be determined, by the L+ dose. Polyvalent sera submitted for testing gave values of 3 to 10 immunity units, while a monovalent Shiga serum gave 20 units or over. These tests were carried out on rabbits. The method of Sachs and Georgi, depending on intravenous injection of white mice, was tested on Japanese white mice and found useful.

W. F. H.

Dumas (J.), Ramon & Bilal (Said). Anatoxine dysentérique. **Dysenteric Anatoxin.** —*Ann. Inst. Pasteur.* 1926. Feb. Vol. 40. No. 2. pp. 134–140. [4 refs.]

A 15-day Shiga culture is filtered through paper prepared with infusorial earth, and then through a Chamberland F. candle. An injection of 1 cc. of 1 in 25 or 1 in 40 dilution of the toxic filtrate intravenously in a rabbit of 2 to 2·4 kilos. produced death in 3 to 5 days with the symptoms of experimental dysentery. To convert this toxin into anatoxin 6 cc. 40 per cent. formaldehyde, which is the optimal dose, is added per litre, and the whole kept at 37° C. After 15 days at this temperature it now required 5 cc. intravenously to produce dysenteric symptoms; after 30 days as much as 10 cc. could be tolerated. For prophylactic testing 0·5 and 1 cc. anatoxin are injected subcutaneously at an interval of 8 days in the rabbit. There is no local lesion and only slight temporary loss of weight. The test of immunization is given by the intravenous injection, two weeks after the last prophylactic dose, of 4, 6 and even 8 lethal doses of toxin or by the subcutaneous injection of 3 to 4 lethal doses of a 24-hour bouillon culture. This easy immunization of the rabbit is contrasted with the difficulty of immunization experienced with toxin, even though it has been attenuated by heat. The serum of rabbits treated with anatoxin does not agglutinate dysentery bacilli. Anatoxin kept in a sealed tube and protected from light retains its antigenic potency for at least twelve months.

In practice anatoxin has been used to immunize horses for the production of antitoxin. After subcutaneous injection of 10, 25, 50 and 100 cc. they can tolerate without inconvenience 250 and even 500 cc. The serum obtained can, in dilutions of 1 in 200 to 1 in 400, neutralize 6 lethal doses of toxin as tested on mice. Some tests have also been carried out in human beings. Doses of 0·5 and 1 cc. anatoxin were used with but slight local inflammatory reaction and no rise of temperature. The efficacy of anatoxin as a prophylactic has still to be worked out on a sufficiently large scale.

W. F. H.

Alivisatos (G. P.) & Jovanovic (M.). Experimenteller Beitrag zur peroralen Immunisierung des Kaninchens gegen Ruhr. [**Oral Immunization of Rabbits against Dysentery.**] —*Cent. f. Bakt.* I. Abt. Orig. 1926. May 5. Vol. 98. No. 5/6. pp. 311–325. [7 refs.]

To be efficient for prophylactic administration on a large scale a vaccine must be capable of preparation on a large scale, be easily administered, and have only a slight reaction. Oral administration is much easier than inoculation.

The points to be determined in the rabbit with a view to the extension of the procedure to man are: (1) What is the smallest dose of killed dysentery organisms which, given *per os*, can protect rabbits against intravenous infection; (2) whether the animal immunized against living virus is also immune to the toxin; (3) how long the immunity lasts; (4) whether the immunity *per os* is usually more quickly attained than that by inoculation.

The experiments showed that, whereas oral doses of 70 mgm. gave a safe protection to even 4 minimum lethal doses, doses of 80–90 mgm. themselves produced in many cases undesirable effects and sometimes

death. This protection, given by oral administration, against the virus extended also to the toxin, but in the latter case wore off, so that the toxin, at first neutralized, ultimately became free and killed the animal. Thus immunized animals, which had been tested with as little as one minimum lethal dose of toxin, died 24 to 38 days later. The immunity resulting from oral administration is therefore not an antitoxic immunity. The duration of immunity to virus was not of indefinite extent: it lasted up to 30 days but not to 45. As regards the rate of development of immunity, this is dependent on the interval between conclusion of the immunization and the infection. For a testing infection immediately after immunization, protection is afforded only to one minimum lethal dose, and sometimes it would appear that the toxic action of the testing dose had added itself to that of a hitherto undeclared toxic effect of the immunizing dose. An interval after immunization of only 4 days, however, already gave a high degree of protection—to one, 2, 4 times the minimum lethal dose.

If now we examine the dictum that "a disease is best prevented by the immunization of its recipient cells," we find that this may be but partially true. There are many cases in which, where it is feasible, protection can be obtained by strictly local application of the protective antigen, but there are other cases in which, *also*, or sometimes *only*, a subcutaneous inoculation (general immunization) is successful: this is the case where there are types of cell, more or less susceptible to virus or toxin, which cannot be reached or cannot be wholly immunized by local application of protective antigen. Both methods then are useful.

And what now of the extension of the procedure of oral dysentery immunization to man? As man is more susceptible than the rabbit to dysentery toxin, therefore it should be possible to effect local immunization with smaller quantities of protective vaccine. A relative immunization is all that would be required in man, as he would not be the subject of such massive infection as were the rabbits used in experiment. This would remove all fear that the protecting dose came too near to the harmful dose for any practical use. Then also the natural mode of infection of man excludes the possibility of pure toxin action, and this gives support to the possibility of oral administration as a means of protection in man for at least a dysentery season: this is backed by the rapidity with which immunity is developed. A note appended to this article states that these *suppositions* have meanwhile received complete confirmation in practice, and that oral immunization has been statistically shown to immunize human beings easily, quickly, and for a dysentery season.

W. F. H.

FUJITA (Koshiro). Zur Frage des Vorkommens des heterogenetischen Antigens bei Bakterien der Coli-Gruppe, nebst Versuchen ueber die Giftigkeit der Shiga-Antisera für Meerschweinchen. ['**The Occurrence of Heterogenetic Antigen in Bacteria of the Coli Group. The Non-Toxicity of Shiga Antisera for Guineapigs.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1925. July 10. Vol. 43. No. 4/5. pp. 329–338. [6 refs.]

Immunization of rabbits with Coli, paratyphoid B, Breslau and Gärtner bacilli did not produce heterogenetic sheep's blood haemolysin. Simultaneous immunization with a paratyphoid B and Gärtner bacillus

mixture also had a negative result. On the other hand, with some of the animals immunization with Shiga bacillus was followed promptly by the formation of heterogenetic haemolysin for sheep's blood. Shiga bacillus therefore, through its capacity to form heterogenetic haemolysin, occupies a unique position. Intravenous injection of 2 cc. of Shiga antiserum proved non-poisonous for guineapigs.

H. M. H.

Schmidt (Hans). Ueber die Fähigkeit der Shiga-Ruhrbazillen, beim Kaninchen heterogenetische Hammelbluthämolysine zu bilden. **The Faculty of Shiga Bacilli of forming Heterogenetic Sheep's Blood Haemolysin in Rabbits.** —*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1925. July 10. Vol. 43. No. 4/5. pp. 422–432. With 3 figs. on 1 plate. [2 refs.]

The author's investigation confirms in essentials the observations of Jijima and Fujita, but not their conclusions in entirety. It is true that many Shiga strains produce a haemolysin for sheep's blood in the rabbit, but this production is only in small measure and the haemolysin is inconstant. He had shown in earlier investigations that in certain conditions Shiga bacilli could produce non-specific enhancement of normal haemolysin in rabbits, and that this naturally labile normal haemolysin is heterogenetic in kind and very lightly adsorbed with others than Shiga bacilli.

H. M. H.

Pick (Ludwig). Zur pathologischen Anatomie der Ruhr im Dünndarm, zugleich ein Beitrag zur Kritik der sog. primären nodulären Ruhr. [**Pathological Anatomy of Dysentery of the Small Intestine. The So-called Primary Nodular Dysentery.**]—*Arch. f. Verdauungs-Krankht.* 1926. Vol. 37. pp. 102–118. With 3 text figs. [20 refs.]

A detailed description and discussion of the morbid histology and gross anatomy of the small intestine in dysentery, as reported by many authors, and as observed by this author himself.

H. M. H.

Mixed and Unclassed Dysentery.

Manifold (J. A.). **Prevalent Type of Dysentery in India.** [Correspondence.]—*Jl. Roy. Army Med. Corps.* 1926. Mar. Vol. 46. No. 3. pp. 238–240.

Major Manifold's letter contains extracts from a communication from Major Knowles, Professor of Protozoology, School of Tropical Medicine, Calcutta, commenting on Manifold's paper on the above subject (*ante* p. 395). Major Knowles writes that the misuse of emetine is rampant and harmful. Emetine does not "soothe the bowel." In cats it causes irregular and violent peristalsis. It can do nothing but harm in bacillary dysentery. He has never seen "cysts" in the stools of acute amoebic dysentery. It is not uncommon to find an occasional cyst or even vegetative form of *E. histolytica* in bacillary dysentery occurring in a histolytica carrier. Mixed amoebic and bacillary infections are not rare. Fletcher at Kuala Lumpur

from study of post-mortem material estimates that 25 per cent. of cases are mixed. At any one time, however, one infection predominates. "Dead amoebae" no one can identify. "Macrophages"—"*this is the cardinal error.*" It is on the finding of these, with ingested r.b.c.s, that all these erroneous percentages of amoebic infection are based. He who hasn't learnt, or won't learn, calls the first macrophage that he sees *E. histolytica.* If cysts plus vegetative forms ever occur together, it is not in the acute amoebic stool, but in a semi-fluid stool in a carrier.

H. M. H.

i. Mitchell (G. F.); Jerwood (B. E.); Boney (Knowles); Jerwood (B. E.); Ledingham (J. C. G.); Boney (Knowles). **Dysentery in Mesopotamia.** Correspondence. *Brit. Med. Jl.* 1926. Mar. 6, 20, 27, Apr. 3, June 5 & 19. pp. 449; 545; 594; 635–636; 966–967; 1062.

ii. British Medical Journal. 1926. June 26. pp. 1097–1098. **The Health of the Army. Annual Report for 1924.**

i. Comments following on Knowles Boney's criticism of the Army Report on the prevalent type of dysentery in Mesopotamia (*ante*, p. 396). In support of Knowles Boney, Mitchell records that in his laboratory work in Mesopotamia, 1917–20, he found two cases of bacillary to one of amoebic dysentery. Jerwood, however, writes that while in charge of dysentery wards of No. 133 British General Hospital, Kut-el-Amara, June 1917 to January 1920, the stools of all cases entered as "clinical dysentery" were examined. Thus—March to December 1918—"Clinical dysentery" 149, *E. histolytica* 141, Entamoeba-free 6, *B. dysenteriae* 0, no organism 2. Though he personally did not do the bacteriological work, he knew that *E. histolytica* was reported present only when: (1) It was seen to be active and containing r.b.c.s; or (2) tetragenous cysts were present. All the other hospitals in Mesopotamia obtained different results, but probably conditions in Kut in 1918 most nearly resembled those in Mesopotamia now. He supposes that defective sanitation generally, including water supply, is the chief aetiological factor in bacillary dysentery, while house flies play the chief part in spreading amoebic dysentery. In Kut, in 1918, sanitation and water supply were good, but house flies abounded; and probably that is the condition of affairs in Mesopotamia, for the army, to-day.

Knowles Boney replies that faulty observation must be the cause of the Kut findings of 94 per cent. amoebic dysentery in 1918, so absolutely at variance with the findings of competent observers everywhere else in Mesopotamia during, before, and after 1918. Local conditions peculiar to Kut could in no way explain this discrepancy. There is no evidence that amoebic dysentery is primarily fly-borne and bacillary mainly water-borne. Both are spread alike by infected water and "the filthy feet of faecal-feeding flies." The water supply of Mesopotamia during the period in question was probably quite as good as it is to-day. He had found in his weekly examinations no lactose fermenters in 10 cc. There is a slight seasonal variation in the two types of dysentery, amoebic being higher in the hot weather; also amoebic occurred in rather higher percentage among the Indian

troops. Neither of these factors has any bearing on the point in question.

Jerwood's rejoinder adds that :—

"1. Not only in 1918, but for the two and a half years that the hospital existed at Kut, *E. histolytica* was usually found in dysenteric stools.

"2. During that time at least four different men did the bacteriology.

"3. Since Kut failed to agree with the majority, the work there received constant supervision from the consulting pathologist, and each successive worker was warned against reporting the presence of *E. histolytica* unless perfectly sure about it.

"4. In 92 cases out of the 141 in which *E. histolytica* was reported it was specially stated : '*E. hist.* tissue invading,' meaning that the amoebae were seen showing activity and containing the red blood cells."

We suggest that the unmentioned "macrophage" was the villain of the piece in Kut, as elsewhere.]

Ledingham supports Boney and Mitchell. Mesopotamian dysentery as he had fully analysed (see this *Bulletin*, Vol. 17, page 31) was amoebic only to the extent of 20 to 25 per cent. of cases. *Epidemic dysentery* in Iraq, as elsewhere, was bacillary. Army Report (1923) states that in Iraq admission rate for dysentery rose from 10·2 to 104·3 per 1,000, "owing to an outbreak of dysentery and diarrhoea affecting a column of troops operating in Northern Kurdistan in April, when some 200 cases occurred." Is it conceivable that these cases were in the main amoebic? He thought not, and concluded that Iraq dysentery had not changed.

Knowles Boney says the importance of the matter needs no stressing, for the *Report of the Health of the Army for the Year* 1923 stands as an official record bearing the stamp of authority and carrying weight that does not attach to the publications of private individuals. The figures in that report are completely at variance with the known facts concerning the epidemiology and bacteriology of dysenteric disease.

ii. In this it is stated that :—

"A short note on dysentery is important in view of the controversy that arose in connection with the record of amoebic dysentery in 1923 [*v.* abstracts *T.D.B.*, above]. The report for 1924 gives no information regarding the commands in which this form of dysentery occurred, but states that, of a total of 810 admissions, 707 were diagnosed as amoebic, 48 as bacillary, 54 as unclassified, and 1 as a carrier. As 669 of the cases occurred in India, and 39 in Iraq, it may be assumed that the majority of the cases diagnosed as amoebic were geographically east of Suez, a fact which again corresponds with previous official returns. Doubts are, however, being thrown on the accuracy of the diagnosis, and investigations are now proceeding to determine whether, as has been suggested, bacillary dysentery is not more prevalent than the records disclose."

H. M. H.

Maire (Georges). Le traitement des dysenteries par le tréparsol. **Treatment of Dysentery by Treparsol.** —*Bull. Méd.* 1926. May 1. Vol. 40. No. 19. pp. 530–532.

The author notes that to Ravaut belongs the credit of having first used arsenical compounds by the buccal route in the treatment of chronic dysenteries. The excellent results obtained by Marchoux with stovarsol in amoebiasis and flagellate dysentery have led to further experiment with other spirillicide arsenicals in treating these affections. The latest of these is tréparsol. It is a formyl derivative

of the oxy-amino-phenyl-arsenic acid, of stable composition but less active than the unstable acid itself. Tréparsol decomposes in the intestine into formic acid and meta-amino-para-oxy-phenylarsenic acid. This acid is the active principle of stovarsol and is said to act directly on the intestinal parasites. Flandin's work showed this compound to be very active in treatment of amoebic dysentery [see this *Bulletin*, Vol. 22. p. 353]. The author has used it in the region of Damascus and Djebel-Druze, where amoebic dysentery is endemic and flagellate dysentery also common, both alone and with other drugs, notably emetine, for adults and children. He concludes from its use in a small number of cases that tréparsol is a medicament of the first rank in the treatment of dysentery.

In acute amoebic dysentery it should be combined with emetine. These two drugs produce rapid sterilization. Tréparsol is also a specific for flagellate diarrhoea, notably for trichomonas and lamblia, especially in their encysted forms. Obstinate diarrhoea, chiefly post-typhoid, is also susceptible to tréparsol treatment. Tréparsol for adults is given in tablet form, 4 a day—dissolved in water, for 4 days—a break of 3 days and then 4 more days of tréparsol 4 tablets a day.

H. M. H.

Drake-Brockman (R. E.). **Some Observations on the Treatment of Chronic Dysentery.**—*Lancet*. 1926. May 1. pp. 905–906. [5 refs.]

The cases were all pensioners treated in the clinics and hospitals of the Ministry of Pensions and the chronicity of the dysenteries varied remarkably. They comprise bacillary and amoebic dysenteries, and mucous colitis in which no pathogenic organisms were found, as well as cases infested with Lamblia, Tetramitus, Trichomonas and *Spirochaeta curvgyrata*. Whereas many hundreds have been cured, a small percentage of cases will require periodical treatment, and a few have proved resistant to every known treatment.

Chronic bacillary dysentery. In most of the cases the causative agent has long disappeared from the stools. B. Shiga has not been found. B. Flexner has been found on rare occasions; this organism lying embedded in the sites of the old intestinal ulcers causes the colitis and repeated exacerbations of the disease. These cases show alternate constipation and muco-diarrhoea with occasional blood. Cure will eventually be obtained only by treatment and restricted diet continued over a period of many months. Bismuth, simarubae et punicae granati decoctum, salol, kerol, and dimol have all been ineffective. Better results have been given by stovarsol or the mixture of tr. ferri perchlor. Mxx. with liq. hydrarg. perchlor. ½ drachm in ½ oz. of water, to be further diluted when taken ter in die after meals. This must be continued for months with restricted diet, and a nightly dose of paraffin to prevent constipation. In cases with loose stools great benefit followed stovarsol, one 4 grain tablet twice daily for a fortnight and then one tablet nightly for a fortnight. No success had been obtained from the use of parathyroid and calcium lactate in a few selected cases.

Chronic amoebic dysentery. These patients are usually healthy looking, even though passing, perhaps, stools of almost pure mucus and blood containing active vegetative forms of the parasite. This free evacuation of active amoebae may account for the fact that such

intractable cases seldom develop liver abscess, of which chronic constipation is invariably the precursor. Pushing the use of ipecacuanha and its derivatives to excess renders the amoebae emetine-fast. Courses of treatment should therefore be given at intervals, notwithstanding presence of entamoebae in the stools. Between the courses of ipecacuanha, yatren or kurchi may be given for a month. Of yatren should be given three pills thrice daily for a fortnight, then 2 pills t.i.d. for one week and for the fourth week one pill t.i.d. Where the sigmoidoscope shows definite ulceration in rectum a 2–4 per cent. solution yatren can be injected and retained in situ for several hours. When, however, the lesions are higher up in colon or in the caecum no drug can at present replace ipecacuanha and its derivatives. Kurchi is a useful adjuvant in some cases, while in others benefit follows the use of massive doses of bismuth. In all cases diet should be kept low during drug therapy. In out-patients good results had been obtained by the use of bismuth subnitras, gr. 30 combined with 10 gr. sodae bicarb. t.i.d.; later, doubling the bismuth and keeping the treatment on for three or four months with pulv. ipecac. radix in 10–20 gr. doses in cachet at bed time for the first month or two only. Emetren was tried without success in a case of chronic resistant amoebic dysentery.

Mucous colitis with infestations. Of these, Lamblia is most common and may aggravate the mucous colitis following true dysentery. Trichomonas, Tetramitus and *Sp. eurygyrata* will all disappear from mucous diarrhoeic stools so soon as the true dysenteric cause be found and treated.

H. M. H.

KÖHLER. Ueber Antidysten. [**Antidysten.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1926. Vol. 30. No. 1. pp. 118–120.

The author's recent visit to Venezuela, where he saw in consultation many cases of amoebic and bacillary dysentery, and his 30 years' experience in the tropics and in Germany of these dysenteries, have prompted the advocacy, in the treatment of these diseases, of cort. simarubae, cort. granati, and lignum campechianum. For long these drugs have been used with success, in intestinal ailments, by the natives of the West Indies and South America. They have not come much into favour in Europe because they have not been used in effective preparations or proper fashion. He has obtained good results always, from a combination of these drugs, in the form of a fluid extract—Antidysten. It is successful not only in the dysenteries, but also in cases of meat, fish and shell-fish poisoning. Antidysten acts on the sympathetic nervous system, and as a general vasoconstrictor, as evidenced, after its use, by the decrease in number of stools and amount of blood in them, respectively. Simaruba, at least, has been shown by KROGMANN to be a vasoconstrictor. Soon after use of Antidysten the stools, furthermore, lose their pungent odour and become more solid. It has no constipating effect. The dose for adults is a table-spoonful every 12 hours—for children a tea- or dessert-spoonful according to age. If vomited it could be given per rectum—for adults 2 tablespoonfuls in oat gruel, or other vehicle. If retained in the gut for 10–15 minutes, the results were as good as when given by mouth. He cites in support other physicians whose experience of Antidysten in treating dysenteries had been entirely favourable

—notably K. Justi, Hongkong, 1913. "In 7 acute cases, after the first dose the diarrhoea ceased and the stools became formed. Its results in chronic bacillary dysentery were astonishing; patients with diarrhoea for weeks and months were cured in a few days."

H. M. H.

Miller (Reginald). **Lambliasis as a Cause of Chronic Enteritis in Children.**—*Arch. of Disease in Childhood.* 1926. Apr. Vol. 1. No. 2. pp. 93–98 [6 refs.] and *Proc. Roy. Soc. Med.* (Section for Study of Disease in Children.) 1926. May. Vol. 19. No. 7. pp. 44–45.

Lamblia infections have become common in England only since the war. Dobell (1920) gave lamblia-carrier-rate as 18·27 per cent. of people in Great Britain, and stated that the protozoon is especially common in children's faeces. Perkins (1921) found out of 120 children (including a considerable number of infants) consecutively admitted to hospital, 7 with lamblia in the faeces– 5·8 per cent. In the author's experience the infection is very much commoner in the hospital class of children than in those dealt with in private practice. His paper is based on a study of 23 children infected with lamblia. In them the infection resembled coeliac disease more than any other disorder. In both there is persistent diarrhoea, some enlargement of abdomen and retardation of growth but symptoms are far more severe and invalidism far greater in coeliac disease. Stools apparently containing an excess of fat may occur in the lamblia cases; several times this led to a suspicion of coeliac disease, but on sending stools to be analysed the report was lamblia infection. The lamblia stool is that of chronic entero-colitis. It contains much undigested food and mucus and perhaps is slightly fatty. In coeliac disease the great abnormality is excess of fat without evidence of enteritis or maldigestion of non-fatty foodstuffs. The most harmful effects of lamblia infection occur in the youngest subjects. It causes wasting and retarded growth; the diarrhoea is worst at onset of infection and persists for many years—throughout childhood. Ordinary disinfectants and stovarsol have proved useless. The author does not agree with those who state that the infection is harmless. So far as children are concerned this is untrue. In cases of long-standing diarrhoea in children, where examination shows no other abnormality than a heavy infection with lamblia, it is not unreasonable to assume that this is the cause of the symptoms; the diarrhoea may last 8 or 10 years. There is no evidence that disorders of the intestine predispose towards lamblia infection. In children true carriers showing no symptoms of the infection may be found; and the infection is now by no means a rarity in hospital practice among children.

H. M. H.

Alessandrini (Paolo) & Piattelli (Adriano). Contributo alla conoscenza della dissenteria da *Balantidium coli*. *Balantidium* ... **Dysentery.** *Policlinico*. Sez. Prat. 1926. Apr. 5. Vol. 33. No. 14. pp. 469–474. [5 refs.]

A case of balantidial dysentery in a woman of 29 years is described. There were numerous evacuations with blood, much pain and tenesmus.

Treatment with emetine, 8 cgm. daily for five days, was adopted. After the second injection there was marked improvement; the temperature became normal, the stools numbered only three or four in the 24 hours, and the parasites could no longer be found. The pain subsided sufficiently to allow sigmoidoscopy to be performed, when ulcers were seen which bled readily, but no protozoa could be detected in the material taken from the bases of them. The patient left hospital on the eighteenth day apparently well and had not returned; the authors, therefore, cannot be certain that the cure was permanent. The remainder of the paper is devoted to a general account of the subject of balantidial dysentery.

H. Harold Scott.

Huppenbauer (C. B.). Die Yatren-105-Therapie der Amöbenruhr.—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1926. Vol. 30. No. 1. pp. 112–117.

——. Therapeutica da amoebiase Yatren 105.—*Sciencia Medica.* 1926. Feb. 28. Vol. 4. No. 2. pp. 84–88.

PELLAGRA.

i. Goldberger (Joseph), Wheeler (G. A.), Lillie (R. D.) & Rogers (L. M.). **A Further Study of Butter, Fresh Beef, and Yeast as Pellagra Preventives, with consideration of the Relation of Factor P-P of Pellagra (and Black Tongue of Dogs) to Vitamin B.** - *Public Health Rep.* 1926. Feb. 19. Vol. 41. No. 8. pp. 297–318. With 5 charts in text. [27 refs.].

ii. - - & Lillie (R. D.). **A Note on an Experimental Pellagralike Condition in the Albino Rat.** *Ibid.* May 28. Vol. 41. No. 22. pp. 1025–1029. [4 refs.]

i. An account is here given of further experiments dealing with pellagra–preventive factor (factor P-P) and its presence or absence in certain food-stuffs. Pellagrins in Georgia State Sanitarium were used for this investigation.

It was found that butter, whether from Georgia or Vermont, given in daily amounts of 5 ozs. was unable to prevent pellagra. This substance is therefore poor or lacking in factor P-P. On the other hand, lean beef given in daily allowance of 7 ozs. completely prevented the disease, as did also dried yeast extract (½ oz. daily).

Experiments were carried out upon dogs suffering from black tongue. It was shown that those substances which were potent in preventing pellagra were similarly potent as regards black tongue, and those substances of low pellagra-preventive potency failed too in the canine disease. The authors have therefore adopted the working hypothesis that pellagra in man and black tongue in dogs are analogous.

The relation of factor P-P to water soluble vitamin B is considered. The antineuritic constituent of this vitamin is not identical with factor P-P but the growth promoting moiety most probably is.

ii. A continuation of the work described above.

In the dog yeast extract autoclaved for two and a half hours prevents black tongue but not polyneuritis. In the rat also it does not prevent polyneuritis nor does it permit growth.

Indian corn is fairly rich in antineuritic factor but it contains relatively little, if any, factor P-P. An alcoholic extract of corn was fed to rats suffering from polyneuritis with the result that recovery occurred unless the condition was too far advanced. Healthy young rats fed upon a diet the vitamin B content of which was represented by 6 per cent. or more of this extract showed some initial growth, but sooner or later their weight began to decline and they developed not polyneuritis but a condition resembling pellagra. When this diet was supplemented by a substance known to contain factor P-P sustained growth resulted. Such a substance was found in yeast extract adsorbed by fuller's earth. It appears, therefore, that vitamin B contains two parts, one antineuritic and thermolabile, the other growth promoting and thermostable. Factor P-P is thought to be identical with the latter.

The pellagra-like condition developing in rats in which vitamin B in the diet was represented by alcoholic corn extract is as follows :— The first symptom is ophthalmia with, at the same time or occurring shortly afterwards, a loss of fur. This latter may lead to complete denudation of the head, neck and trunk. In less advanced cases

the depilation is often bilaterally symmetrical and sharply defined. With or without such depilation some of the animals develop a dermatitis, also sharply outlined and bilaterally symmetrical, on one or more of the following sites—ears, front of neck and upper part of chest, forearms, backs of fore-paws, shins and backs of hind-paws. In addition certain of the animals presented a glossitis and two had diarrhoea. It was found that when factor P-P was given the symptoms cleared up and growth was resumed.

The authors admit that while it is highly probable that this condition in the rat is the analogue of human pellagra additional evidence is required.

A. D. Bigland.

Mook (William H.) & Weiss (Richard S.). **Pellagra. Two Instructive Cases.**—*Arch. Dermat. & Syph.* 1925. Nov. Vol. 12. No. 5. pp. 649—656. With 5 text figs. [3 refs.]

Two cases of pellagra are described in detail on account of their bearing upon the protein-deficiency origin of the disease.

Case 1. White girl, aged 16. Finding herself at the age of 14 6 ft. 1 in. in height and 190 lbs. in weight she decided to diet herself. The regular diet of the family was not well balanced to start with, so that when she omitted one meal a day and took for the rest a preponderance of fat and carbohydrate pellagra developed.

On admission to hospital she weighed only 71 lb. Forthwith a pure protein diet was instituted but still she lost weight. There was added, therefore, cod liver oil, tomato juice, hydrochloric acid and pepsin, thyroid extract, bile salts, pancreatin and taka diastase. By this time her weight had dropped to 55 lb. but in less than two months it had increased to 100 lb. and the pellagra symptoms had disappeared.

Case 2. White vagrant, aged 52. Previously his meals had been scanty and very poor in quality. On a pure protein diet he made a complete recovery. An interesting feature of the case was the experimental production of a typical pellagrous dermatitis by exposing the chest to sunlight. This dermatitis lasted a long time and only disappeared when the rash in the usual situations began to fade.

The authors consider that " the first case is strikingly confirmatory of Goldberger's dietary deficiency theory and the second case of Jobling and Arnold's theory that the circulation in the blood of porphyrins and other photosensitive substances is responsible for the skin manifestations of pellagra."

A. D. B.

Barnes (John M.). **Typical Pellagra Syndrome developing in Patient with Chronic Ulcerative Colitis while under Hospital Treatment.**—*Ann. Clin. Med.* Baltimore. 1926. Jan. Vol. 4. No. 7. pp. 552–564. With 4 text figs.

A case of pellagra occurring in a patient suffering from chronic ulcerative colitis is described. The patient was a coloured married woman aged 24. In June 1924 she began to feel ill but diarrhoea did not begin until the following October. She was in hospital in November and December of that year and was then discharged because she refused operation. She was readmitted at the end of March 1925. In May, June and July a typical pellagra rash appeared. The patient

grew weaker and died in July. A very full account of the autopsy is given. The findings revealed little differing from the usual post-mortem appearances found in these cases except that "the marked degenerative changes in the central nervous system emphasised by some writers were not shown in this case, nor have they been in several other cases of typical pellagra studied in this laboratory."

It appears that this patient in May 1924 (i.e., prior to all symptoms) had a "non-pruritic rash on both hands which cleared up spontaneously." She had also left a pellagrous locality only six months before the first definite symptoms appeared. The author admits that the initial rash may have been in reality pellagra. It would seem, therefore, that the colitis was merely the usual concomitant of pellagra, so that the title of this paper is somewhat misleading.

A. D. B.

Nuzum (Franklin R.). **Pellagra associated with Annular Carcinoma of the Terminal Portion of the Ileum.** *Jl. Amer. Med. Assoc.* 1925. Dec. 12. Vol. 85. No. 24. pp. 1861–1862. [5 refs.]

Mechanical obstruction to the alimentary tract interfering with nutrition is known to be associated with pellagra. A number of such cases collected from the literature are described. These deal with obstruction situated in the stomach. To this series the author adds two cases of his own in which the obstruction was a carcinoma involving the lower end of the small intestine. Both the patients were males of white race, aged 58 and 68 respectively, and both died, autopsies being performed.

It is interesting to note that the time elapsing between the onset of pellagra symptoms and the admission of the patient to hospital was in one case four months and in the other two months. It is possible that the onset of pellagra occurred shortly after the initial lesion began to cause obstruction.

The author is of the opinion that "these added instances of disturbance in nutrition as the result of mechanical obstruction of the small bowel give added weight to the dietetic origin of this disease."

A. D. B.

Delamare (G.) & Djémil (Said). Pellagre importée. [**Imported Pellagra.**]—*Bull. Soc. Path. Exot.* 1926. Feb. 10. Vol. 19. No. 2. pp. 75-78.

This paper deals with cases of pellagra as it was found in Constantinople among prisoners of war repatriated from Egypt or Anatolia in 1920 and since the evacuation of the Greeks from Asia in 1923. The only real epidemic outbreaks occurred in Sélimié-Haidar-Pacha, where repatriated prisoners of war were gathered together. Apparently, a very fatal outbreak took place in this district in 1920. No description of this is given, and the authors content themselves with describing three cases in detail.

Case I. Officer cadet, aged 25. Had his first attack of pellagra when in a prison camp in Egypt in 1919. In August 1921 he sustained a relapse, but the case was not fully investigated until December 1921. There were then no frank signs of pellagra, though the increased frequence of the pulse rate with hypotension and undoubted exaggeration of the deep reflexes led the authors to suppose that the man's

present condition represented merely a remission. Stress is laid upon fibrillary tremors of the tongue when fully protruded as an important sign. This patient had eaten white bread for the last year with fresh vegetables and had only been deprived of meat for one month.

Case II. Soldier, aged 38. Repatriated from Egypt in January 1920. He was then suffering from pellagra. From this he recovered and went back to duty. In December 1921 he apparently had a relapse and mental symptoms supervening he died in February 1922.

Case III. Sous-officier, aged 37. In 1919 had pellagra in Belbis Camp. Repatriated from Egypt in October 1920. When examined in December 1921 there were no signs of pellagra, but the patient showed great weakness, wasting and profound mental symptoms. Having excluded Addison's disease and tuberculosis the authors regard this as a post-pellagrous condition.

[It is to be regretted that in view of the large amount of work done upon pellagrous Turkish prisoners of war in Egypt this paper does not deal more fully with the after histories of the cases on their return to their native land.]

A. D. B.

Delamare (G.) & Achitouv. Pellagre familiale autochtone. [**Autochthonous Familial Pellagra.**] —*Bull. Soc. Path. Exot.* 1926. Feb. 10. Vol. 19. No. 2. pp. 78–81.

Two cases of pellagra are described at Constantinople occurring in the same family. The first patient was a rabbi, aged 67. His initial attack took place in the spring of 1916. Following this he was quite well until the spring of 1921, when he had a relapse. He had not been out of Constantinople during the last 37 years. The second case, a relation of the first and living in the same house, was a shoemaker aged 47. He had never left Constantinople, and had not been in contact with prisoners of war. The authors lay stress upon the following syndrome in the diagnosis of pellagra: A red tremulous tongue protruded with difficulty; normal pupils; exaggeration of the tendon reflexes; clonus; abolished or diminished cutaneous reflexes and a normal cerebro-spinal fluid.

A. D. B.

Popoff (P. P.). Le pellagre en Arménie en rapport avec l'état actuel de la question de son étiologie. [**Pellagra in Armenia and Present Knowledge of its Etiology.**] —*Oeuvres de l'Inst. Tropicale de l'Armenie.* 1926. Vol. 1. French summary pp. 8–9. [In Russian.]

The following points are extracted from the French abstract of the above paper.

Twenty-two cases of pellagra have been studied by the author in Armenia since 1923. He states that the disease has not yet been diagnosed in this country, and he is of the opinion that the high mortality rate proves its recent importation. Pellagra occurs not only among refugees from Turkey, but also in those who have never left the country, and a familial incidence of the disease is noted. Maize as a food is not known in Armenia, but Simulium was found

in the pellagrous areas. In one refugee hospice nine out of ten orphan children attacked, died. Post-mortem examinations were made in four cases, but the details are as yet insufficient. Histological studies are in progress. Blood showed a slight lymphocytosis and the urine had, invariably, an acid reaction.

A. D. B.

Matuschka (J.). Ein Fall von genuiner Pellagra in Kärnten. [**A Case of Pellagra in Carinthia.** *Wien. Klin. Woch.* 1926. Feb. 4. Vol. 39. No. 6. pp. 159–160. [1 ref.]

The first case of pellagra occurring in Carinthia is here recorded. The following is a brief account of the findings: The patient, a married woman of 50, had lived all her life in a local village. Symptoms of the disease, from the account of which the diagnosis is certainly correct, began in the spring of 1925. No specialized treatment was given, and attempts were made to keep up the patient's strength; these, however, proved unsuccessful, and in June 1925 she died.

Autopsy revealed the usual conditions—brown atrophy of the heart, atrophy of the mucous membrane of the stomach and upper part of the small intestine, ulceration in the ileum and large intestine and central softening of the suprarenals.

As an aetiological factor it is mentioned that maize, and bad maize at that, had figured prominently in the diet prior to the onset of the pellagra.

With a view to ascertaining whether the skin of pellagrins is unduly sensitive to light rays experiments involving exposure of the skin to an arc lamp were instituted. No greater reaction than occurred in normal patients was noted.

A. D. B.

Shelley (Horace M.). **Some Observations on Pellagra in Nyasaland.** – *Nyasaland Protectorate Ann. Med. Rep.* 1924. 7 pp. With 1 fig.; also in *Kenya Med. Jl.* 1925. Nov. Vol. 2. No. 8. pp. 235–244. [11 refs.]

Pellagra was first found in Nyasaland by Stannus in 1910. In 1922 its presence was again noted by Milne-Tough. This paper is based upon a study of pellagrins in the Central Prison Hospital, Zomba, and in the general population. It is to be noted that the disease is not confined to prisoners as was previously thought, cases having occurred amongst the general population and in the native soldiers of the King's African Rifles.

The author is of the opinion that pellagra is not caused solely by diet. He thinks that the disease is due to absorption of a toxin which produces a neuritis of certain peripheral nerves, since he found skin lesions most marked in the areas supplied by the following nerve roots, viz.: Cervical, 2–7; lumbar, 4 and 5; and sacral, 1.

Besides the peripheral neuritis, the toxin is supposed to produce changes in the thyroid gland leading to insufficiency of thyroxin, and a parallel is drawn between myxoedema and pellagra. Administration of thyroid extract gr. 1 a day caused the skin lesions to disappear in from 10 to 15 days, with physical and mental improvement. Neither arsenic nor hydrochloric acid was of any avail.

The prison ration was as follows: Maize meal, 1½ lbs., or rice, 1 lb., with ½ oz. salt. Fish or meat, peas, beans or nuts and vegetables, of each, ½ lb. 4 days a week.

A. D. B.

Farrell (Frederic J.) & Yacovlev (P. J.). **Pellagra and Beri-beri.**—*Ann. Clin. Med.* Baltimore. 1926. Jan. Vol. 4. No. 7. pp. 541–551. With 6 text figs. [4 refs.]

A case observed by the authors showing difficulty in differential diagnosis forms the starting point of a long argument in which it is attempted to prove that pellagra and beriberi are one and the same condition. A most elaborate comparison of the two diseases symptom by symptom and post-mortem appearance by appearance is offered in support of this contention.

The case may be summarized shortly as follows: Coloured man, aged 37 -standard of living low--principal foods, fish and corn bread. In May 1925 he began to suffer from weakness, vomiting and diarrhoea. Later he became dizzy and developed an ataxic gait. The arms also became weak. He was admitted to hospital (Newport, Rhode Island) on June 3rd 1925. His condition then was: Mentality showed indifference; bilateral foot and wrist drop; marked wasting of muscles; variable oedema of hands, legs and face; deep hyperaesthesia; alterations in sensibility; deep reflexes absent; marked photophobia and dimness of vision at night; tongue the colour of beef; constipation. The skin showed irregular ecchymoses, an area of desquamation with lack of pigment on the left chest, desquamation on the feet and legs and a symmetrical vesicular dermatitis on the neck. During his three months' stay in hospital there was slight improvement, though the muscular wasting increased.

After excluding other possible diagnoses it was decided to call the case either pellagra or beriberi. As already stated the authors' opinion is that "there is no essential difference between these two diseases—they are probably different expressions of the same pathological condition."

[From the photographs reproduced and from the clinical description given pellagra, to say the least, is an improbable diagnosis.]

A. D. B.

Bravetta (Eugenio). Pellagra sporadica. [**Sporadic Pellagra.**]—*Boll. Soc. Med. Chirurg.* Pavia. 1925. Vol. 37. No. 6. pp. 913–924. With 1 fig.

The author calls attention to the fact that in 1915 cases of pellagra in Milan and its environs had been diminishing in number, and that since that date the disease was supposed to have disappeared, while the number of patients diagnosed as psychoses, due to the war or associated with encephalitis lethargica and cocainism, had increased. He then gives details of five cases which had come under his personal observation during 1925, all of which from the history and symptoms appear to have been definitely pellagrous, thus showing that the general belief that pellagra had been eradicated is erroneous.

H. Harold Scott.

GUTHRIE (J. Birney). **Pellagra—Hydrochloric Acid in the Stomach Contents.**—*New Orleans Med. & Surg. Jl.* 1926. June. Vol. 78. No. 12. pp. 830–835. [11 refs.]

In a series of 35 coloured female pellagrins a study was made of the astric hydrochloric acid content. Achlorhydria is common in pellagra, the figures gathered from the literature varying between 28 and 100 per cent. In the series under discussion achlorhydria was found in 62·8 per cent. A comparison was made in this respect between 10 fatal cases and 25 non-fatal cases. Hydrochloric acid was completely absent in 60 per cent. of the former and in 64 per cent. of the latter. The presence or absence of this gastric constituent is, therefore, of no prognostic significance though of some diagnostic value. It is pointed out that diarrhœa itself may cause deficiency or absence of hydrochloric acid. Out of 93 pellagrins diarrhœa was present in 76·3 per cent.

The administration of hydrochloric acid to pellagrous cases is advocated as a therapeutic measure, a contraindication being soreness of the mouth, throat or œsophagus.

A. D. B.

SUSMAN (William). **The Morbid Anatomy and Histology of Pellagra.**—*Edinburgh Med. Jl.* 1926. Feb. N.S. Vol. 33. No. 2. pp. 58–64. With 10 text figs.

An account of the morbid anatomy and histology of two cases of pellagra, one "pronounced" and the other "probable," is given.

Case 1. Female, aged 46, pronounced pellagra. The macroscopical changes found were similar to those in most of the other cases reported, i.e., brown atrophy of the heart, atrophy of the intestinal mucosa, etc. The most interesting of the histological changes were found in the endocrine system.

(*a*) *Thyroid.*—"A generalized fibrosis, epithelial proliferation in the vesicles, marked congestion, and an embryonic adenoma are the most prominent features." Small round cells are found in abundance, and from the arrangement of these it is concluded that the irritant was spread by way of the lymphatics.

(*b*) *Parathyroid.*—There are small localized areas of fibrosis together with many plasma cells and other cells the appearance of which suggests an interstitial origin.

(*c*) *Adrenals.*—"A non-inflammatory disintegration of cortical cells is present chiefly in the zona glomerulosa and less frequently in the zona fasciculata. The scarcity of lipoidal vacuoles in the cortex is conspicuous. In the medulla the cells are not as prominent as usual, and fibrosis has occurred to a moderate degree."

(*d*) *Pituitary.*—In the pars nervosa congestion of capillaries, many haemorrhagic areas and some neuroglial proliferation were seen. In the pars anterior in addition to marked congestion acidophilic cells, small but numerous, and not showing the usual red granules were encountered. Basophilic cells were very abundant.

In certain regions of the spinal cord a unilateral degeneration of the dorso-spino-cerebellar tract was noted. No mention of cortical changes is made.

Case 2. Showed very similar changes in the endocrine system.

The author concludes that the oldest lesion is in the thyroid. Metabolic disturbances and changes due to the causal agent are responsible for the liver damage. Toxic material is excreted through the kidney, causing degeneration and later fibrosis.

[These results would have been of greater value had the author examined other endocrine organs of the same age as controls.]

A. D. B.

MOURIQUAND (Georges). Syndrome pellagreux. Sa réalisation expérimentale. **Experimental Pellagra.** —*C.R. Acad. Sci.* 1926. Feb. 1. Vol. 18. No. 5. pp. 347–348.

The author describes experiments with guineapigs which were subjected to the following régimes :—

1. A diet consisting of maize with, in addition, vitamin C, fat soluble vitamin and nitrogenous and mineral elements.
2. A diet consisting only of maize and vitamin C.

In each series some of the animals were exposed to ultra-violet rays, and others were not.

The results of the experiments may be tabulated as follows :—

(1) The rays had no effect on the determination of cutaneous lesions.

(2) The animals in series 1 remained well nourished and showed no change in their coats, etc.

(3) The animals in series 2 in 6 out of 7 cases showed marked falling of the hair, beginning at the 18th to the 20th day. This occurred whether the maize was whole or polished.

The author is of the opinion that the pellagra-producing power of maize is only exercised in the presence of a partially unbalanced diet.

A. D. B.

MOURIQUAND (Georges). Existe-t-il une vitamine antipellagreuse ? [**Is there an Antipellagrous Vitamin ?**] —*C.R. Soc. Biol.* 1926. Mar. 5. Vol. 94. No. 8. pp. 498–499. [1 ref.]

From considerations of the author's own work (see above) together with the fact that peasants in Roumania and Bulgaria eat whole maize, it is concluded that FUNK'S anti-pellagra vitamin does not exist in the cuticle of maize.

A. D. B.

RABIES: A REVIEW OF RECENT ARTICLES. V.*

During the last six months a number of important contributions have appeared relating to the relative prevalence of paralytic accidents with various forms of antirabic immunization, and to their causation.

This subject was referred to in some detail in my last review (*ante*, p. 195) in its statistical aspect, and reference has already been made to the experiments of Koritschoner and Schweinburg in which, after the exhibition of large doses of normal rabbit brain substance, 16 out of 72 rabbits showed paralyses [this *Bulletin*, Vol. 22, p. 699]. All observers agree as to the existence of a definite relation between the amount of nerve substance inoculated and the probability of accident, but certain find difficulty in accepting Koritschoner and Schweinburg's experimental results. Quast and Licht[1], after a lengthy and critical examination, suggest that the paralyses may have been caused by some other neurotropic virus introduced with the inoculant. It has been observed, they state, that the brains of men who have not suffered from the symptoms of encephalitis lethargica, when inoculated into rabbits, may give rise to encephalitis, which is transmissible on subpassage (Jahnel and Illert, *Klin. Wochenschr.*, 1923, p. 1731).

Cornwall and Beer[2] put forward the criticism that in addition to the possibility of a high susceptibility amongst the animals employed, "one cannot avoid suspecting that there was some additional factor at work to account for the high mortality in their series." They suggest, "that this may have been unhygienic surroundings, or a defective diet, in the absence of specific information on these points." Cornwall and Beer[3] analyse the various experiences on the basis of dose per body weight, and calculate that Koritschoner and Schweinburg employed doses varying from 15 to 225 mgm. per kilo. body-weight and that Harvey and Acton (1922) showed that 1,060 mgm. per kilo. were highly toxic. They themselves, using the Indian carbolized virus, gave doses of 11 to 800 mgm. per kilo. and observed only one case of paralysis amongst 40 rabbits. They conclude that phenol slightly reduces the toxicity of nerve substance. This conclusion is supported by an analysis of statistical evidence. They calculate that in dried cord treatment the total dosage varies from 18 to 46 mgm. per kilo: in treatment according to Högyes' method, the dosage is 0·8 to 3·8 mgm. per kilo., and in treatment by carbolized methods the dosage is 11 mgm. per kilo (Indian method) and 94 (Fermi).

As accidents have not so far been recorded after treatment by carbolized vaccines, and very few with Högyes' method in its usual

* For the fourth of this series see this Volume, pp. 194–200.

[1] Quast (Gerhard) & Licht (Hans). Ein Beitrag zur Frage des Entstehens der postvakzinellen Lähmungen bei Lyssa.—*Cent. f. Bakt.* I. Abt. Orig. 1926. Apr. 1. Vol. 98. No. 3/4. pp. 211–216. [8 refs.]

[2] Cornwall (J. W.) & Beer (W. A.). The Effect of Etherized Normal Brain Substance injected Subcutaneously into Rabbits.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 807–816. With 4 charts in text. [2 refs.]

[3] Cornwall (J. W.) & Beer (W. A.). On the Occurrence of Paralyses after Treatment with Antirabic Vaccine.—*Indian Jl. Med. Res.* 1926. Jan. Vol. 13. No. 3. pp. 467–474. With 2 charts in text. [4 refs.]

dosage, they conclude that the maximum safe dose of fresh cord is about 3·8 mgm. per kilo for fresh nervous material, and about 10 mgm. per kilo for carbolized material.

Two very important additions to our knowledge are furnished by the papers of v. d. Hoven v. Genderen[4] [5] and of Boecker[6]. The former has analysed the statistics of the Pasteur Institute at Weltevreden, now transferred to Bandoeng (Java). From 1895 to 1906 the dried cord method was used, and from 1906 to 1922 the method was that of Högyes. Amongst a total of 13,396 Europeans so treated 21 cases of paralyses occurred, and the interesting fact emerges that these cases were confined in both instances to the later years of the particular form of treatment. Analysis showed that of 704 patients treated by a dried cord method in which a 1-day dried cord was not exhibited before the 15th day, no case of paralysis occurred, whereas amongst the second or later group of 719, when a more intensive treatment was given, in which 1-day dried cords were exhibited on the 4th day of treatment or earlier, 10 cases of paralysis occurred. The same phenomenon was observed with Högyes' method. No accidents amongst 212 patients were observed in the period 1906–1907, when the total dosage was 35 mgm. to 198 mgm. Again, during the period 1908–1909, when the dosage was 35 to 765 mgm., there were no accidents amongst 305 persons. From 1910 to 1912, when the dosage was further increased to 92 to 1,015 mgm., 5 accidents occurred amongst 434 patients; and from 1912 to 1922, with a dosage of 92 to 605 mgm., 4 accidents were reported amongst 2,421 patients. Further examination showed that in the latter two periods accidents were confined to patients who received more than 300 mgm. of fixed virus brain substance. As with the earlier and lighter dried cord methods at least 1,000 mgm. was administered with no accidents; the author concludes that this toxic effect is removed by drying.

The experience of the Berlin Pasteur Institute analysed by Boecker[6] supports these conclusions, whilst drawing attention to a paper by Papamarku (*Zeitschr. f. Hyg. u. Inf.*, 86, 85, 1918) in which similar deductions had been made. During the period 1914–1917, when treatment was very intense (1-day dried cords being exhibited on the 3rd and 4th day of treatment), 8 accidents occurred amongst 903 patients (0·89 per cent.). Within the next period 1915-1923 (when 1-day dried cords were not given earlier than the 8th day), 13 accidents were observed amongst 4,113 patients (0·32 per cent.). During a third period, 1916–1923, when nothing stronger than 3-day dried cords was administered, only 2 accidents were observed amongst 1,070 patients (0·19 per cent.). The author also states that certain of these accidents occurred in cases in which the dog which was

---

[4] van den Hoven van Genderen (Jeanne). Ueber eine Anzahl Paralysen, die im Verlauf der antirabischen Behandlung im Institut Pasteur zu Weltevreden vorkamen.—*Ztschr. f. Hyg. u. Infektionskr.* 1925. Nov. 9. Vol. 105. No. 2. pp. 427–449. [29 refs.]

[5] van den Hoven van Genderen (Jeanne). Opmerkingen naar aanleiding van een aantal paralysen, voorgekomen in het verloop der antirabische bahandeling aan het Institut Pasteur te Weltevreden.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1925. Vol. 65. No. 6. pp. 677–715. [9 refs.] [Dutch version of (4).]

[6] Boecker (E.). Zur Frage der Impflähmungen und der Erfolge bei verschiedenen Methoden der Tollwutschutzimpfung.—*Ztschr. f. Hyg. u. Infektionskr.* 1926. Mar. 18. Vol. 106. No. 1. pp. 151–185. [23 refs.]

concerned remained healthy. Since 1923 treatment has been by the Högyes-Phillips method (1 part F. V. brain in 9 parts glycerine, diluted finally to 1 in 25 with physiological saline, and in doses varying from 0·25 to 2 cc.). Amongst 4,063 persons treated according to this method 5 have suffered from accident, or 0·123 per cent.

Summarizing these results and observations we must conclude that the larger the quantity of vaccine given the greater is the danger of accident, and that the more a cord is dried the less is the danger. To these facts must be added the observation of CORNWALL[3] that the probability of accident is reduced by phenol, and that of ALIVISATOS[8] that ether has a similar effect (1 accident amongst 6,500 cases treated). If one accepts the statement that normal brain substance itself increases the liability to accident, then the problem would be a comparatively simple one, but one has to face the fact that KORITSCHONER and SCHWEINBURG found that dried normal brain substance was more toxic than fresh. The issue is still obscure, and further systematic animal experiments are necessary. CORNWALL and BEER'S[2] observation that the ether extract of normal sheep's brain when injected in quantities corresponding to 500 mgm. per kilo of original sheep brain substance produced no ill effects upon 10 rabbits, shows that the effect of ether is not that of a simple extraction of a toxic material. Were it not for KORITSCHONER and SCHWEINBURG'S observation that drying increases the toxic action of normal nerve substance, one might return to HARVEY and MCKENDRICK'S view (*Sc. Mem. Gov. of India*, 1907) that accidents are anaphylactic in character; the effects of drying, and of ether and phenol causing the protein to become denatured, and so to lose its specificity (as shown by PICK). Further experiments on the relative toxic effects of large quantities of normal brain substance, in doses such as were used by KORITSCHONER and SCHWEINBURG, fresh and denatured according to the different methods, are eminently desirable.

ISABOLINSKY and ZEITLIN[9] report only one case of paralysis during fifteen years' experience. The method of treatment employed is that of CALMETTE.

Before leaving this question it is only fair to add that Dr. Joseph KOCH[7] (Berlin) does not agree with BOECKER and PAPAMARKU'S conclusions. He has never seen a case of vaccinal rabies. His views on the harmlessness of pasteurian treatment remain undisturbed even by the work of VAN GENDEREN. Tropical results cannot be compared with European. They may be mixed infections with malaria and other tropical complaints. Accidents may, in his opinion, be due to the combined action of fixed and street virus. VAN GENDEREN'S[5] experience is, however, against this view. In her statistics it appears that of those who suffered from paralyses, 5 were patients who had only been licked, 2 occurred amongst the staff of the institute, and had neither been bitten nor licked, and in the case of 2 others it was subsequently proved that the biting animal was not rabid (one remained alive and well).

[7] KOCH (Jos.). Bemerkungen zu der vorstehenden Arbeit von Boecker.—*Ibid.* pp. 186–187.

[8] ALIVISATOS (G. P.). Neue Erfahrungen bei der Schutzimpfung gegen Lyssa durch das ätherisierte "Virus fixe."—*Cent. f. Bakt.* I. Abt. Orig. 1926. May 5. Vol. 98. No. 5/6. pp. 394–407. [6 refs.]

[9] ISABOLINSKY (M.) & ZEITLIN (A.). Ueber das intensive Verfahren der Schutzimpfungen gegen Lyssa.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1925. Dec. 10. Vol. 45. No. 3/4. pp. 301–304.

ii. *The Virus.*

Cornwall and Beer[10] criticize the conclusion of Levaditi and Nicolau (*C.R. Soc. Biol.*, 1925, Vol. 93, pp. 3–7), that the fact that subpassages made from animals inoculated with street virus and killed on the 4th day could not be transmitted beyond the 3rd or 4th generation, is in favour of the existence of an evolutive cycle in the development of the rabies organism. A similar experiment was carried out with Coonoor strain of fixed virus (940th passage), which usually gives rise to symptoms on the 5th day in rabbits. They found that subpassages made on the 3rd day could not be transmitted beyond the 2nd generation, whilst subpassages made on later days continued indefinitely. They conclude that by the 4th day sufficient virus had been developed in the brain to enable the infecting dose (0·01 gm. of brain substance) to transmit the infection. "If the incubation period of the street virus used by Levaditi and Nicolau at all approximated to the usual average of 14 days, the result which they obtained was to be expected." Cornwall and Beer conclude that the phenomenon is due to a slower rate of growth of street virus in the brain as compared with fixed virus.

Manouélian and Viala[11] examined the variation in number of Negri bodies and of the small dots, which they consider to be the *Encephalitozoon rabici*, in successive subpassages. The former quickly disappear, whilst the latter "remain a constant evidence of all forms of rabies infection," even when virulence is increased by subpassages.

Ando[12] tested the virulence of fixed virus which had been subjected to various treatments; and found that the best vaccines for dog inoculation were those which had been kept at 37° C. for 3 days, or 22° C. for 5 days.

Cornwall and Beer,[13] in a further communication, plead for a standard method whereby the virulence of various strains of fixed virus in use at different institutes may be compared, and by means of which the protective power of a vaccine prepared from any strain of fixed virus against any strain of street virus may be determined. For testing the virulence of fixed virus they suggest that the test animals should be albino rats weighing between 80 and 120 gm. : that the infective dose should be 0·01 gm. per 100 gm. body weight, given in a dilution of 1 part in 50 parts 0·85 saline : that inoculation should be into the subcutaneous tissue of the left loin : that not less than 100 animals should be used for each determination : the result being read in terms of the percentage of animals which developed rabies. For the Coonoor strain of F. V. (940th passage), they proved that this percentage was 14·6 (18 deaths amongst 123 albino rats).

---

[10] Cornwall (J. W.) & Beer (W. A.). On the Rate of Multiplication of Rabies Fixed-Virus in Rabbits.—*Indian Jl. Med. Res.* 1926. Jan. Vol. 13. No. 3. pp. 475–481. [1 ref.]

[11] Manouélian (Y.) & Viala (J.). Exaltation du virus rabique et corps de Negri.—*C.R. Acad. Sci.* 1926. May 25. Vol. 182. No. 21. pp. 1297–1298.

[12] Ando (Keizaburo). [Studies on the Virulency of the Fixed Virus of Hydrophobia.]—*Jikken Igaku Zasshi* (*Jl. Experim. Med.*). 1925. Feb. Vol. 9. No. 2. [Summarized in *Japan Med. World.* 1925. Nov. 15. Vol. 5. No. 11. p. 321.]

[13] Cornwall (J. W.) & Beer (W. A.). The Assessment of the Infectivity of Rabies Fixed-Virus by Means of Albino Rats.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 803–806. [2 refs.]

Plantureux[14] has examined the Algerian Fixed Virus (1,500th passage) and found that it transmits infection when administered intraocularly. This confirms Marie's observations with the Paris strain (1,255th passage), and contrasts with Puntoni's statement that the Rome Fixed Virus (1,850th passage) had lost its virulence when administered both subcutaneously and intraocularly, though it remained active when given intradurally or intracerebrally.

Remlinger and Bailly[15] have studied the action of mixtures of rabies and herpes viruses. They find that there is no evidence of antagonism. The course of events depends upon the relative susceptibility of animals, so treated, to the two diseases, and upon the relative durations of the two incubation periods.

Following up a previous line of experiment, in which Goodpasture[16] noted that, when the virus of herpes simplex is inoculated into the right masseter muscle, the first resulting cerebral lesion is located in the corresponding 5th motor nucleus, this author has now carried out similar experiments with rabies virus. After intra-masseter inoculations, symptoms were first observed in the anterior extremities, the earlier being in the limb of the side inoculated; also "lyssa bodies" (or very minute Negri bodies) were present in excess in the ganglion cells of the 5th motor nuclei. Negri bodies proper were, however, found over a large area. Goodpasture distinguishes "lyssa bodies" which contain no "Innenkörper," from the larger forms in which internal structure is seen. He believes that the Negri body proper is formed within the living cell by a focal degeneration of neurofibrillar substance, which coheres about one or more of the structures which result from mitochondrial degeneration. The inclusion of these living bodies gives rise to the characteristic architecture of the Negri body, which alone serves to distinguish them from "lyssa bodies." He believes that all the changes observed are degenerative in origin. Illustrations are given to support these views.

Quast[17] discusses the case of a treated patient who died of tubercular meningitis some three weeks after being bitten. Four rabbits were inoculated with emulsions of the patient's hippocampus, and all died of fixed virus rabies (showing first symptoms about the 5th day). With the object of determining whether this was a constant condition of the brain of treated patients, or whether the concomitant disease had given rise to a *locus minoris resistentiae*, he treated three dogs in the ordinary way, and killed them on, or a couple of days after, the completion of treatment. Successful transmission to the 3rd generation was attained if a thick emulsion of hippocampus was used

---

14 Plantureux (Edm.). Pouvoir infectant du virus rabique fixe d'Alger inoculé dans la chambre antérieure de l'oeil et le tissu conjonctif sous-cutané de divers animaux.—*C.R. Soc. Biol.* 1926. Feb. 5. Vol. 94. No. 4. pp. 247–249. [2 refs.]

15 Remlinger (P.) & Bailly (J.). Action des mélanges de virus rabique et herpétique.—*C.R. Soc. Biol.* 1925. Dec. 18. Vol. 93. No. 37. pp. 1486–1488. [1 ref.]

16 Goodpasture (Ernest W.). A Study of Rabies, with Reference to a Neural Transmission of the Virus in Rabbits, and the Structure and Significance of Negri Bodies.—*Amer. Jl. Path.* 1925. Nov. Vol. 1. No. 6. pp. 547–582. With 5 figs. on 2 plates. [31 refs.]

17 Quast (Gerhard). Ein Beitrag zur Frage des Verbleibes des durch die Wutschutz-Impfung dem menschlichen Körper einverleibten Virus fixe.—*Cent. f. Bakt.* I. Abt. Orig. 1925. Dec. 12. Vol. 97. No. 1. pp. 53–56. [4 refs.]

for the transmitting dose. Thus the fixed virus was present in comparatively small quantities. The author concludes that fixed virus finds its way into the central nervous system, and remains there in a latent condition for a considerable period of time. (See also CORNWALL and BEER[10] *supra*).

iii. *Serum Immunity.*

PHISALIX[18] has found that a virus serum mixture of approximately equal parts of fixed virus emulsion and the serum of the viper, the adder, and the hedgehog (Hérisson) protects rabbits against intraocular inoculation with fixed virus. He[19] has also shown that the serum of the eel, an animal which possesses a natural immunity against rabies, contains rabicidal substances. Such a serum, like the serum of the viper, is rabicidal *in vitro* as also *in vivo*.

SABLINE[20] cites a case in which symptoms of rabies appeared one month after the bite in spite of the fact that the serum was experimentally shown to contain a considerable quantity of antibodies. This suggests, according to the author, that the immunity of rabies may be independent of antibody formation, that is to say it may be a local immunity of the Besredka type.

MIROLUBOVA[21] has found that antibodies are developed more quickly in fat than in lean persons, and that they are no longer demonstrable after 60 days.

HOROWITZ-WLASSOWA,[22] using complement deviation as an index to prevalence of antibodies, finds that the sera of rabbits immunized with the salivary glands of rabid dogs develop antibodies against the virus but not against brain substance, whereas if the immunizing agent be fixed virus, complement deviation is obtained with fixed or street virus, and also with normal brain substance. For diagnostic purposes, if the brain substance of a suspected animal is available, it should be tested against the sera of rabbits immunized with rabid salivary glands; and conversely if the salivary gland is to be tested it can be tested against the sera of rabbits immunized with fixed virus.

iv. *Diagnosis.*

Attention is drawn by BORMAN[23] to the difficulty of differentiating red blood cells from Negri bodies, in tissues stained by the usual

[18] PHISALIX. Vaccination du lapin contre l'inoculation intracérébrale de virus rabique fixe, par inoculation sous-cutanée des mélanges virus-sérum de Vipère, de Couleuvre ou de Hérisson, avec excés de virus.—*C.R. Acad. Sci.* 1926. Feb. 15. Vol. 182. No. 7. pp. 499–501.

[19] PHISALIX. Immunité naturelle de l'Anguille vis-à-vis du virus rabique et action rabicide de son sérum.—*C.R. Acad. Sci.* 1926. Jan. 11. Vol. 182. No. 2. pp. 182–184.

[20] SABLINE (D. W.). [De la nature de l'immunité dans la rage.]—*Jl. de Microbiol. de Path. et de Maladies infectieuses.* 1925. Vol. 2. No. 4. p. 16. [In Russian.] [Summarized in *Bull. Inst. Pasteur.* 1926. May 31. Vol. 24. No. 10. pp. 455–456.]

[21] MIROLUBOVA (E. J.). [Du pouvoir rabicide des sérums consécutifs au traitement pastorien.]—*Jl. de Microbiol. de Path. et de Maladies infectieuses.* 1925. Vol. 2. No. 4. p. 23. [In Russian.] [Summarized in *Bull. Inst. Pasteur.* 1926. May 31. Vol. 24. No. 10. p. 456.]

[22] HOROWITZ-WLASSOWA (L.). Ueber die Komplementablenkungsreaktion bei der Tollwut.—*Cent. f. Bakt.* I. Abt. Orig. 1926. Apr. 1. Vol. 98. No. 3/4. pp. 216–227.

[23] BORMAN (Earle K.). Eliminating a Source of Error in the Laboratory Diagnosis of Rabies.—*Amer. Jl. Public Health.* 1926. May. Vol. 16. No. 5. pp. 467–468.

methods. He has found that these red blood cells may be dissolved out of smear preparations by the action of glacial acetic acid. The smears should be as thin as possible. They are placed directly in a solution containing 98 cc. of methyl alcohol (C. P.) and 2 cc. of glacial acetic acid for three minutes : dried carefully over a flame : transferred to a 10 per cent. aqueous solution of potassium carbonate for five minutes : washed gently, and dried with blotting paper. Any staining method for Negri bodies may then be applied ; the author himself employs the usual methylene blue (aqueous saturated solution), 3 drops, basic fuchsin (saturated alcoholic solution), 2 drops, tap water 20 cc.

The sections are warmed slightly and the stain is allowed to operate for not more than one minute : then washed and dried. The staining solution deteriorates rapidly. If the large nerve cells are clear blue, and the matrix a dull red, it is an indication of excessive treatment with the acid fixative or of insufficient treatment with the carbonate solution. A properly prepared specimen should show the large nerve cells with reddish blue cytoplasm, and deep blue nuclei in a matrix of brilliant red. Negri bodies are strawberry red and show their typical structure.

Pinzani[24] recommends the following method :

1. Sections 5–7 μ, cut in paraffin and fixed to the slide by Meyer's albumen : abs. alc : iodized alcohol (2 to 3 drops of iodine in 5 cc. alc.), till yellow, to remove traces of sublimate from the fixing solution, and also as a mordant.
2. Wash in water.
3. Stain for 5 minutes in hot Ziehl's fuchsin.
4. Wash in water.
5. Immerse in a solution of sulphite of soda (10 per cent. aqueous solution freshly prepared), until sections assume a rose colour. It is not possible to fix a limit to the time required, as this depends upon the fixative used. A very short time is required for specimens fixed in alcohol, a much longer period (1 to 2 minutes) if fixed in sublimate or Zenker.
6. Wash in water.
7. Counter stain in aqueous methylene blue (1 in 4,000), for 30 seconds.
8. Wash in water.
9. Differentiate in alcohol 30 and 60 per cent.
10. Abs. alc. : xylol : balsam.

Negri bodies are coloured rose brown and show their characteristic structure. Nuclei of nerve cells are coloured violet.

The best appearances are found after fixation with Zenker or Schaudinn's fluid, or in Neri's solution (2 parts of saturated aqueous solution of sublimate to 1 of absolute alcohol) ; results after fixation in alcohol are less satisfactory. For fixation the author recommends the following methods :—

1. Zenker's solution for six hours ; wash in running water for three hours : weak alcohol three hours : absolute alcohol nine hours (changing 3 times) : xylol two and a half hours (changing 3 times), paraffin two and a half hours. Total twenty-six hours.

[24] Pinzani (Gino). Diagnosi microscopica della rabbia.—*Policlinico.* Sez. Prat. 1925. Dec. 14. Vol. 32. No. 50. pp. 1748–1750.

2. Schaudinn's fluid for 4–6 hours : weak alcohol 3 hours : absolute alcohol, xylol and paraffin as in (1). Total 23 hours.

Stuart and Krikorian[25] after fixation in Zenker, stain their sections by the following method :—

1. Haematoxylin 7 to 10 minutes.
2. " Blue " well in tap water.
3. Counter stain in acid fuchsin 3 minutes.
4. Differentiate in tap water.
5. Pass rapidly through alcohol, oil of cloves to balsam.

v. *Methods of Immunization and Statistics.*

Alivisatos[8] contributes further information regarding the ether method. The street virus of Serbia is a strong one, which gives a relatively short incubation period in man (13, 16, 10, and 17 days have been observed), not only in the case of wolf bites but also after dog bites. Thus a more rapid method than that of Högyes was imperative. [See also above with reference to paralytic accidents.]

Various simplifications of procedure are proposed by v. d. Hoven v. Genderen[26]. The brain substance is emulsified by shaking in a closed vessel containing glass beads. Monkeys are used in place of rabbits for vaccinal material. These are infected with fixed virus subpassaged in the usual way through rabbits. The vehicle used for emulsification is glycerine. She found, *inter alia*, that fixed virus emulsified in glycerine (Schering), diluted with 25 per cent. of normal saline, maintains its virulence for more than a year at temperatures of minus 10 and 15 degrees Celsius. The following table shows the results of the various modifications of treatment which have been employed at Bandoeng (Java) since the inception of the institute. :—

Method.	*Patients.*	*Total deaths.*	*Failures.*
Dried cord	816	19 (2·33%)	10 (1·22%)
Dried intensive	1,490	37 (2·48%)	16 (1·08%)
Högyes	1,231	32 (2·6%)	13 (1·05%)
Högyes intensive	2,799	37 (1·32%)	6 (0·21%)
Högyes, using monkey's brain	1,311	14 (1·06%)	0
Högyes, using monkey's brain (emulsified in glycerine) ...	599	2 (0·33%)	0

The occurrence of paralytic accidents at this institute has already been referred to.

Botafogo Gonsalves[27] has found that fixed virus does not deteriorate appreciably during a period of three months when kept in carbolized olive oil (0·5 per cent. phenol), whereas attenuation is observed if the concentration of phenol is 2 per cent. He finds that suspensions in oil are not so virulent as suspensions in saline, and considers that this is due to interference with absorption by the nerve terminals. He concludes that the use of oil as a vehicle brings about a gradual and continuous exhibition of the immunizing dose, and

[25] Stuart (G.) & Krikorian (K. S.). Anti-Rabic Procedure in Palestine with Special Reference to Decentralization of Treatment.—*Ann. Trop. Med. & Parasit.* 1925. Dec. 16. Vol. 19. No. 4. pp. 391–418. [10 refs.]

[26] van den Hoven van Genderen (Jeanne). Rabies-Department ; Technique of the Antirabic Treatment and its Result at the Pasteur Institute.—*Meded. Dienst. d. Volksgezondheid Nederl.-Indië.* 1926. Pt. 2. pp. 115–130. With 1 plate.

[27] Botafogo Gonsalves (N.). Lipovaccination antirabique. Action de l'huile phéniquée sur le virus rabique.—*C.R. Soc. Biol.* 1926. Jan. 22. Vol. 94. No. 2. pp. 167–168. [1 ref.]

hence that larger and less frequent dosage may be employed. He advises that all laboratories should adopt the method.

Gloster and Taylor[28] from an extended series of experiments conclude that carbolized vaccines may be kept equally at 0 C. and at room temperatures of approximately 30 C. without loss of immunizing properties. Stevenson, King, Nicholas and Lahiri[29] similarly announce results which show that temperatures of 37 C. for 3 days have no appreciable deleterious effect. These experiments were undertaken with the object of determining whether, under the climatic conditions of India, carbolised vaccine could be dispatched from central institutes for treatment at local centres.

From the Pasteur Institute at Kasauli (India) where the Indian carbolized vaccine is employed, King[30] reports 61 deaths (0·78 per cent.) and 34 failures (0·43 per cent.) amongst 7,852 persons treated. The rates according to position of bite are as follows: Leg 0·31, trunk 0·69 arm 0·58, face 5·06, multiple (excluding face) 2·33, multiple face 5·08. Seventeen per cent. of the total number, 7,852, were bitten by jackals, and 40 per cent. of the total deaths were due to jackal bites. An examination of figures from 1910 to date shows that amongst 4,000 persons treated for licks no deaths occurred. A remarkable case is reported in which a jackal bit a large number of people. Of these 81 came for treatment (75 arrived within 4 days after they had been bitten). Seven succumbed from rabies, all more than 15 days after completion of treatment: a failure rate of 8·6 per cent.

From Lyons, Rochaix[31] reports no deaths amongst 315 persons treated, and from Paris, Viala[32] had no deaths amongst 782.

vi. *Canine Rabies and its Control.*

A large number of experiments, which are too elaborate to cite in detail, dealing with the immunizing properties of single doses of vaccine are reported by various authors. Schlingman[33] has investigated the effects of a modification of treatment based upon the methods of Kondo and Semple, in which the vaccinal material consists of brain and cord substance of dogs which had been infected with fixed virus, emulsified in carbol saline, incubated at 37 C. and thereafter refrigerated for a length of time, sufficient to render the vaccine innocuous as

---

[28] Gloster (T. H.) & Taylor (J.), assisted by Menon (K. N.). The Keeping Properties of Carbolized Anti-Rabic Virus.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 835–852.

[29] Stevenson (W. D. H.), King (H. H.), Nicholas (M. J.) & Lahiri (B. N.). The Effect of Heat on Rabies Vaccine. Part I.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 879–884.

King (H. H.), Nicholas (M. J.) & Lahiri (B. N.). The Effect of Heat on Rabies Vaccine. Part II.—*Ibid.* pp. 885–893.

[30] Kasauli. Pasteur Institute of India. The Twenty-Fourth Annual Report of the Central Committee of the Association and the Audited Accounts up to June 30th, 1925, also the Report of the Director of the Institute for the Year ending 31st December, 1924. [Stevenson (W. D. H.).]—pp.xvii+30. Simla: "The Simla Times" Press.

[31] Rochaix (A.). Le traitement antirabique dans la région Lyonnaise en 1924.—*Jl. Physiol. et Path. Générale.* 1926. Jan. Vol. 24. No. 1. pp. 86–88.

[32] Viala (Jules). Les vaccinations antirabiques à l'Institut Pasteur en 1925.—*Ann. Inst. Pasteur.* 1926. May. Vol. 40. No. 5. pp. 450–453.

[33] Schlingman (A. S.). Prophylactic Immunization of Dogs against Rabies by a Single Injection of a Dead-Virus Vaccine.—*Jl. Amer. Med. Assoc.* 1925. Dec. Vol. 68. New Ser. Vol. 21. No. 3. pp. 299–305. [15 refs.]

tested by subdural injection. He found that a single dose of 5 cc. of this vaccine protected dogs against relatively large doses of fixed virus given intracranially.

Miessner and Baars[34] contrast the immunizing properties of various strains of fixed virus, of the Japanese vaccine, and of Lyssin (F. V. suspension quickly dried for 24 hours in a Faust-Heim drying chamber at 30° C.). The total number of animals employed for these tests was 98. The results showed that the subcutaneous route of inoculation was preferable to the intra-abdominal: that a dose of one gram of nerve substance should not be exceeded, and that favourable results were obtained by all methods. They consider that Lyssin is a suitable and satisfactory vaccine. It remains fully virulent for at least 60 days after desiccation.

Plantureux[35] performed experiments on rabbits with lipo-vaccine, dextrinized vaccine, and phenolized horse serum vaccine, and states that the latter vaccine when administered in 3 doses gave successful results.

Velu, Bigot and Eyraud[36] tested Umeno and Doi's vaccine given in 3 doses of 2 cc. each, and found that the immunity developed was of short duration, and therefore insufficient. Papers of a more or less general character by Schern,[37] Velu,[38] Moore,[39] Boyd,[40] Schlegel[41] and Lanfranchi[42] are mainly of local interest.

A considerable increase of canine rabies is reported from New York City.[43] The number of persons bitten by dogs has doubled itself during the last 5 years, whilst the number of rabid dogs has increased from 44 in 1920 to 76 in 1926. Muzzling is to be introduced.

vi. *Miscellaneous.*

For intracranial inoculation of rabbits Remlinger[44] finds that in place of trephining, a suitable perforation may be made by a simple instrument such as a shoemaker's awl.

---

[34] Miessner (H.) & Baars (G.). Immunisierungsversuche gegen Tollwut an Hunden.—*Cent. f. Bakt.* I. Abt. Orig. 1926. Vol. 97. No. 4/7. pp. 55–61.

[35] Plantureux (Edmond). Contribution à l'étude du traitement préventif de la rage chez les animaux.—*Ann. Inst. Pasteur.* 1926. Feb. Vol. 40. No. 2. pp. 141–151. [12 refs.]

[36] Velu (H.), Bigot (A.) & Eyraud (R.). Essai de vaccination préventive contre la rage par intervention unique.—*C.R. Soc. Biol.* 1926. Apr. 23. Vol. 94. No. 13. pp. 967–968.

[37] Schern (Kurt). Ueber Tollwutimmunisierung und die Notwendigkeit der obligatorischen Impfung aller im Verkehrsleben befindlichen Hunde.—*Seuchenbekämpfung.* 1926. Vol. 3. No. 1. pp. 46–50. [4 refs.]

[38] Velu (H.). La prophylaxie de la rage d'après les conceptions modernes. Comment on pourrait la réaliser au Maroc.—*Maroc-Médical.* 1925. Mar. 15. No. 39. 4 pp. [2 refs.]

[39] Moore (John). Rabies in Animals.—*Vet. Jl.* 1926. Jan. Vol. 82. No. 1. pp. 5–8.

[40] Boyd (J. E. M.). Some Notes on Canine Rabies.—*Jl. Roy. Army Med. Corps.* 1926. Jan. Vol. 46. No. 1. pp. 23–31.

[41] Schlegel (M.). Zur Kenntnis der Tollwut.—*Berlin. Tierärzt. Woch.* 1926. May 14. Vol. 42. No. 20. pp. 329–334. With 4 text figs. [13 refs.]

[42] Lanfranchi (Alessandro). Le vaccinazioni anti-rabiche.—*Mod. Zooiatro.* 1926. May 1. Year 15. Ser. 5. No. 18. pp. 403–407.

[43] Public Health Reports. 1926. Feb. 26. Vol. 41. No. 9. p. 384.—Rabies and Dog Bites in New York City, 1921 to 1925.

[44] Remlinger (P.). Au sujet de la vaccination contre la rage: procédés rapides d'inoculation des lapins de passage.—*Ann. Inst. Pasteur.* 1926. Feb. Vol. 40. No. 2. pp. 167–168.

KAWATANI[45] suggests that wounds should be washed with a solution of "Laimsol" (1 in 30), or of lactic acid (1 in 10), or of glacial acetic acid (1 in 10). He has found that if the eyes are washed within six hours after intracorneal injection with 100 cc. of any one of these solutions for a period of 2 minutes, with a velocity of flow of 4 metres per minute, infection is prevented.

A historical account of treatment of rabies in 1766 by means of mercury is related in the *Journal de Médecine de Bordeaux.*[46] A résumé of FERMI's monograph contrasting the various methods of antirabic treatment, which was previously referred to in these reviews (this *Bulletin*, Vol. 22, p. 242), is published in *Seuchenbekämpfung*.[47]

MALONE[48] in a general article states that rabies was probably first introduced into Canada in 1810. In the year 1904 many cases were imported from New York State. The disease spread to Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. Quebec remained free until the beginning of this year, when an outbreak occurred in Gatineau.

From a study of the symptomatology, microscopical appearances, and experimental transmission to animals, LAIGRET[49] concludes that the disease "*chiens fous*" of West Africa is identical with rabies.

KNACK[50] considers that the human organism is not indifferent to antirabic treatment, although marked disturbances only occur in rare cases. He consequently does not advise further decentralisation of treatment. 175 cases under treatment were examined with respect to general condition, body weight, temperature, blood pressure, urine, the Wassermann reaction, and blood characters.

A. G. McKendrick.

---

45 KAWATANI (Saneto). [Experimental Studies on the Prophylactic Treatment of Hydrophobia.]—*Saikingaku Zasshi* (*Jl. of Bact.*). 1925. Apr. No. 350. [Summarized in *Japan Med. World.* 1925. Nov. 15. Vol. 5. No. 11. p. 323.]

46 JOURNAL DE MÉDECINE DE BORDEAUX. 1926. Jan. 25. Vol. 103. No. 2. pp. 60–61. Le traitement de la rage dans le Sarladais en 1766.

47 FERMI (Claudio). Die Lyssaschutzimpfungsmethode nach Fermi verglichen mit allen derzeit verwendeten Hundswut-Schutzimpfverfahren.—*Seuchenbekämpfung.* 1926. Vol. 3. No. 2. pp. 114–130. 1 [ref.]

48 MALONE (R. H.). Rabies.—*Canadian Med. Assoc. Jl.* 1926. Mar. Vol. 16. No. 3. pp. 288–292.

49 LAIGRET. La rage en Afrique équatoriale française.—*Ann. de Méd. et de Pharm. Colon.* 1926. Jan.–Feb.–Mar. Vol. 24. No. 1. pp. 77–82. [11 refs].

50 KNACK (A. V.). Klinischer Beitrag zur Tollwutschutzimpfung und Bericht ueber einen Fall von atypischer Lyssa.—*Ztschr. f. Hyg. u. Infektionskr.* 1926. Mar. 18. Vol. 106. No. 1. pp. 36–49. [13 refs.]

MEDICAL ZOOLOGY.

Schilling (Claus). Die Uebertragung parasitischer Protisten durch Parasiten höherer Ordnung. **The Transmission of Microparasites by Parasites of Higher Grade.** *Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1925. Vol. 29. No. 1. pp. 312–316.

This is a brief fragmentary discourse on the subject of the transmission of microparasites by parasites of higher grade. After a brief recital of an historic sort, attention is drawn to some well-recognized lacunae, the author regretting that since his countrymen have no laboratories of their own in the tropics they must "spin hypotheses at home." His speculations on the subject of kala azar transmission, which fill about three-quarters of a page, are put out of countenance by the sagacious observations reported last year from Calcutta. In his historic introduction the author states, quoting Ross as his authority, that the idea that blood-parasites of man are transmitted by ectoparasites of man originated in 1877 with [Joseph] Bancroft; and as this error is the opening statement of an article having a didactic purpose and included in a "Festschrift" it is imperative to expose it.

The reviewer has spared no pains in his endeavour to comprehend this extraordinary statement, which he concludes must rest upon a supposition that Joseph Bancroft might have furnished Manson with the idea of investigating the mosquito as the possible "nurse" of *Filaria bancrofti*. The reviewer, however, cannot discover that Joseph Bancroft ever had any communication with Manson, or, indeed, ever published any observations at all on the subject of the transmission of the Filaria named after him. Such observations as Joseph Bancroft made on this subject appear to have been communicated by him first to Dr. W. Roberts, the eminent specialist on urinary diseases, and afterwards to Dr. Spencer Cobbold. Dr. Roberts, who refers to Bancroft as "my old pupil," gave the following account of Bancroft's views in his well-known *Treatise on Urinary and Renal Diseases* (p. 656 of 4th edition):—

"Dr. Bancroft of Brisbane discovered filariae in the blood of persons suffering from chylous urine in Queensland, Australia. He kindly sent me some specimens preserved in glycerine and water, enclosed in hermetically sealed tubes. I had no difficulty in identifying these with the filariae described by Lewis. Dr. Bancroft infers from his experience that the disease is not communicated from person to person in the same family, but thinks that it may be communicated by drinking contaminated water. The filariae found by Dr. Bancroft were also submitted for examination to Dr. Cobbold."

Different statements of Bancroft's views made by Cobbold (who seems to have acted as a sort of publicity agent both to Bancroft and to Manson) are incongruous both with the statement made by Roberts and one with another. But in Cobbold's long paper on *The Life-history of Filaria bancrofti*, read before the Linnean Society on the 7th March, 1878 (and published in the Society's Zoology *Journal* for 1879, Vol. xiv, p. 356) –a paper which professes to be "the nearest approximation to a correct chronological record" that the author can give of the various links in the discovery of this life-history—the entire "fame" of the "remarkable discovery of the intermediate host" is

assigned to MANSON, and in the concomitant account of BANCROFT'S contributions no mention whatever is made of the existence of any anticipatory suspicions by BANCROFT.

A. Alcock.

GALEATI (Agostino). Portatori di protozoi e di elminti. [**Protozoal and Helminth Carriers.**]—*Arch. Ital. Sci. Med. Colon.* Tripoli. 1925. Nov.–Dec. Vol. 6. No. 11–12. pp. 167–170. [8 refs.]

The author examined the faeces of 125 persons in Italy, 60 men and 65 women, free from any intestinal disturbance, to ascertain whether they were harbouring protozoal or helminthic parasites. He found *E. histolytica* in three of the men, none in the women ; *E. coli* in nine men and five women ; *Trichomonas intestinalis* in four men and two women ; *Giardia intestinalis* in two men and one woman. Ova of *Trichuris trichiura* were present in six men and fourteen women (16 per cent.), *Ascaris lumbricoides* in two men and three women, and *Taenia solium* in one man.

H. Harold Scott.

COLAS-BELCOUR (J.) & LWOFF (André). L'utilisation des glucides par quelques protozoaires. **The Utilization of Sugars by Protozoa.**]—*C.R. Soc. Biol.* 1925. Dec. 11. Vol. 93. No. 36. pp. 1421–1422. [3 refs.]

The authors remark on the paucity of exact observations on this subject. They note those of KUDICKE & EVERS, that the survival of *Trypanosoma brucei* in culture was prolonged by the addition of particular glucides—glucose, levulose, mannose, and glycerine—to the bouillon medium ; and those of several other workers on the beneficial effect of glucose upon the culture of divers Haematozoa. Their own experiments have been to compare the capacity of a free living protozoon—the Ciliate Infusorian, *Glaucoma piriformis*—with that of three parasitic protozoa—*Leptomonas ctenocephali*, and *Leishmania tropica* and *donovani*—in their power of utilizing various glucides, and, without permitting themselves to generalize beyond the isolated facts, they find that the free species has a wider range than the parasitic species.

A. A.

i. SERGENT (Et. & Edm.) & CATANEI (A.). Etude expérimentale du paludisme des oiseaux (*Plasmodium relictum*). Suite des essais de traitement préventif ou curatif par des produits autres que la quinine : cinchonine (XXX[e] note). Action de la cinchonine sur le plasmodium pendant la période aiguë. [**Experimental Study of Bird Malaria. Treatment by Cinchonine and Stovarsol.** —*Arch. Inst. Pasteur d'Algérie.* 1925. June. Vol. 3. No. 2. pp. 122–123. [1 ref.]

ii. —— & ——. Suite des essais de traitement par des produits autres que la quinine : le stovarsol (XXXI[e] note).—*Ibid.* pp. 124–126. [1 ref.]

i. In 32 out of 36 experiments on canaries infected with *Plasmodium relictum* large amounts of cinchonine, in divided doses, rapidly and strikingly reduced the number of parasites in the peripheral blood

(in 25 cases in twenty-four hours, in 7 cases in forty-eight hours). In the controls the parasites remained numerous for 8 to 15 days, and 6 of the 14 controls died.

ii. In 7 experiments on canaries stovarsol given in sublethal doses had no effect on the parasites (*Plasmodium relictum*).

A. A.

Catanei (A.). Étude expérimentale de l'association de la spirochétose et du paludisme des oiseaux. **Experimental Study of the Association of Spirochetosis and Malaria in Birds.** —*Arch. Inst. Pasteur d'Algérie.* 1925. June. Vol. 3. No. 2. pp. 111–121. With 2 text figs. [6 refs.]

Experimental infection of canaries with *Spirochaeta gallinarum* and *Plasmodium relictum.*

In a pure infection with *S. gallinarum* spirochaetes appear in the peripheral blood after 2 days and disappear in 3 or 4 days, and thereafter lasting immunity is established. Prior injection of an emulsion of a Culex fed on blood rich in spirochaetes did not protect a bird from infection. Spirochaetosis induced during the incubation or the acute stages of a Plasmodium infection aggravated both infections. Birds recovered from spirochaetosis respond in the usual way to a subsequent infection with *Plasmodium relictum.* Spirochaetosis induced during the chronic stage of a Plasmodium infection develops normally and also almost always provokes a Plasmodium relapse, which may be mortal. Specific reinoculation of birds " premunised " to *P. relictum* causes an acute development of the infection if the Plasmodium and the spirochaete are injected simultaneously.

A. A.

Dobell (Clifford). **On the Species of *Isospora* parasitic in Man.**—*Parasitology.* 1926. Jan. Vol. 18. No. 1. pp. 74–85. [5 refs.]

[*Inter arma silent leges.*] The conclusions expressed in this controversial paper are that " (1) there is as yet no good evidence to prove that more than one species of Isospora occurs in man ; (2) there are no sound reasons for changing the name of this species from *I. hominis* (Rivolta) Dobell, 1919, to *I. belli* Wenyon, 1923 ; (3) and consequently the name *I. belli* Wenyon should, for the present, be regarded as a synonym of *I. hominis* (Rivolta)." [In the event of experts coming to a unanimous conclusion of this business the medical profession will be guided in accordance.]

A. A.

Leger (André). Un cas de coccidiose intestinale humaine à *Isospora belli* à Hué (Annam). [**Case of Intestinal Coccidiosis in Man at Hué.**]—*Bull. Soc. Path. Exot.* 1926. Feb. 10. Vol. 19. No. 2. pp. 95–96.

In recording this case the author states that it is the only one out of 12,000 stool-examinations made at Hué during three years ending 1924 in which cysts of Coccidia were found. The patient in this unique case was an Annamite boy, rather thin, and exhibiting dysenteriform symptoms (said to have persisted for more than 3

months). Many oocysts of *Isospora belli* of Wenyon were found in his stools along with eggs of ascaris and trichocephalus and Charcot-Leyden crystals, but no amoebae or cysts. After treatment with santonine and calomel and a course of emetine injections the oocysts disappeared from the stools.

A. A.

Thomson (John Gordon) & Robertson (Andrew). **Fish as the Source of Certain Coccidia recently described as Intestinal Parasites of Man.**—*Brit. Med. Jl.* 1926. Feb. 13. pp. 282–283. With 2 text figs. [8 refs.]

In this interesting paper we learn with some relief that certain coccidia recently added to the horrible list of hominid parasites (one cannot use the beautiful term "human" in confederacy with an intestinal parasite) are merely common parasites of common food-fishes, of the indigestible spores of which man purges himself in the course of nature.

How many species of coccidia the medical man may, furthermore, relieve his mind of cannot be stated with certainty until experts, who appear rather to have forced the things upon the profession, are agreed upon certain delicate questions of specific definement. Their *names*, however, are five, namely *Eimeria sardinae* Thélohan, very common and often found in enormous numbers in the milt of herrings (including sprats); *E. clupearum* Thélohan, found in the liver of herring, sprat, and mackerel; *E. oxyspora* Dobell, which the authors consider to be identical with *E. sardinae*; *E. wenyoni* Dobell, considered identical with *E. clupearum*; and *E. snijdersi* Dobell, regarded as a degenerate or altered form of *E. sardinae*.

The authors refer regretfully to a certain pride of knowledge which zoologists display towards medical men. The reviewer has no personal experience of this treatment, which certainly did not exist in Huxley's day. Huxley, however, was a medical man himself and would have known that there is not one zoologist in a hundred or more who starts working, either on general zoology or an any particular group of animals, with such a thorough grounding in the anatomy (including histology), physiology, and pathological anatomy of any particular animal type as the medical student has to undergo in his study of the human type. It is to be hoped that the authors are mistaken in their opinion that zoologists have taken up a superior attitude to our profession, both on sentimental and on practical grounds—both because of the time-honoured academic association of Zoology and Medicine, and because—as the recent history of tropical medicine has so beautifully illustrated—the science of medicine has its roots and its living growth in biology.

A. A.

Wenyon (C. M.). **Coccidia of Fish in Human Faeces.** Correspondence.]—*Brit. Med. Jl.* 1926. Feb. 20. p. 347.

Wenyon remarks, with reference to the paper by Thomson and Robertson on the origin of the oöcysts of certain coccidia found in human faeces, that he has for some time been of opinion that *Eimeria*

wenyoni and *E. oxyspora* of Dobell were not parasites of man, but corresponded, as Thomson & Robertson have demonstrated, with *E. clupearum* and *E. sardinae* of Thélohan.

A. A.

Thomson (J. G.) & Robertson (Andrew). **Experimental Passage of the Oocysts of Fish Coccidia through the Human Intestine.**—*Brit. Med. Jl.* 1926. Mar. 6. pp. 420–421. [2 refs.]

Referring to their discovery that certain coccidia (oocysts) supposed to be parasites of man are really common parasites of common food-fishes and merely pass through man's gut as the indigestible residue of a meal consisting of infected fish, the authors now relate a confirmatory experiment. A good large meal of herring-milt infected with *Eimeria sardinae* was taken at 8 p.m. 2 hours after the bowel had been cleared by a strong saline purge. No other food was taken until the following morning, when, at 10 o'clock, a stool containing the oocysts was passed. The next stool did not contain any oocysts, and the volunteer suffered no ill effects.

The authors, who at first discovered fish infected with *E. sardinae* in fishmongers' shops—in the milt of *all* the herrings purchased—have since found them (oocysts) in tinned sardines from Portugal and in tinned soft-roes of herrings from Norway.

A. A.

Libert (Edmond). Le tubage duodénal. Ses applications au diagnostic et au traitement. Considérations sur la flore duodénale normale et pathologique. [**The Normal and Pathological Duodenal Flora.**]—126 pp. With 28 text figs. 1924. Paris. J. B. Baillière et fils.

Attention is drawn to p. 73 and pp. 103–106 of this book upon the applications to diagnosis and treatment of a knowledge of the contents of the duodenal fluid obtained by tubage from the living body. In the pages last cited the author states that the animal parasite oftenest found in this fluid is the living *Giardia intestinalis*; and he quotes other authors, and emphasizes his own confirmation, to the effect that this parasite is practically restricted to the duodenum whilst it is alive. In page 73 he states that in a case of amoebic hepatitis he observed the liquid drawn from the duodenum to be at first turbid and full of polynuclear leucocytes, with some amoebae, and soon afterwards to become transparent, of a golden-yellow colour, and full of giardias not seen in the turbid fluid first drawn.

A. A.

Castex (M. R.) & Galán (J. C.). [**Giardiasis of Biliary Passages.**]—*Arch. Arg. de Enf. del Ap. Digestivo.* Buenos Aires. 1925. Oct. Vol. 1. p. 30. [Summarized in *Jl. Amer. Med. Assoc.* 1926. Jan. 9. Vol. 86. No. 2. p. 157.]

The summary states that in 11 cases the liver was enlarged in 63 per cent., general toxaemia existed in 81·8 per cent., constipation in 54·5 per cent., and digestive disturbances in 72·7 per cent.; and that of all the drugs tried neo-arsphenamin by the vein proved the most effective, even if it did not always extirpate the parasite.

A. A.

Andrews (Justin M.). **Cultivation of Trichomonas. Thermal Death-Point, Anaerobic Conditions, Attempts at Sterilization.**—*Jl. Parasit.* 1926. Mar. Vol. 12. No. 3. pp. 148–157. [8 refs.]

In this paper known methods and media for cultivating Trichomonas are discussed. Five species "lived and multiplied under conditions which indicate that they are facultative anaerobes." The active forms of all the species studied were killed at a temperature of 49° C.

A. A.

Gupta (Piraj Mohan Das). **On a Species of *Trichomonas* prevalent in Calcutta.**—*Indian Med. Gaz.* 1926. Jan. Vol. 61. No. 1. pp. 10–14. [19 refs.]

The experiments here recorded, showing that Pentatrichomonas, in rich cultures, given to kittens by the mouth, can pass through the stomach alive and settle in the caecum, appear to have been performed carefully and with all reasonable precautions. Bodo, on the other hand (a coprozoic species), is destroyed in the gut.

A. A.

Tanabe (Misao). **The Cultivation of Trichomonads from Man, Rat and Owl.**—*Jl. Parasit.* 1925. Dec. Vol. 12. No. 2. pp. 101–104. [8 refs.]

The author gives the composition of a medium for cultivation of certain Trichomonads. On this medium, in a pH reaction of 8 to 8·2, and at a temperature of 35° C., they are said to multiply to a maximum by 48 hours, to be decreasing at 72 hours, and to become extinct in a week. The medium is said to be advantageous by discouraging growth of bacteria. Its composition is as follows: "NaCl, 0·7 gm.; sodium citrate, 1·0 gm.; Löffler's blood-serum (dehydrated), 0·5 gm.; white of egg, 2 cc.; distilled water, 100 cc." To be well shaken when adding the white of egg, and again when finally adding the blood-serum.

A. A.

Holmes (Francis O.). **The Relation of *Herpetomonas elmassiani* (Migone) to its Plant and Insect Hosts.**—*Biol. Bull.* 1925. Nov. Vol. 49. No. 5. pp. 323–337. With 5 text figs. [5 refs.]

——. **Non-Pathogenicity of the Milkweed Flagellate in Maryland.**—*Phytopathology.* 1925. May. Vol. 15. No. 5. pp. 294–296. [5 refs.]

——. **Geographical Distribution of the Milkweed Flagellate, *Herpetomonas elmassiani* (Migone).**—*Ibid.* pp. 297–299. With 1 text fig.

Herpetomonas elmassiani appears to be widely prevalent in American milkweeds (*Asclepias syriaca*, and other species), inhabiting only the laticiferous vacuoles, but not the protoplasm of the cells of the latex system; it may be present in large numbers without doing any apparent harm to the plant. The bug *Oncopeltus fasciatus*, whose range coincides with that of the flagellate, is suspected of being the insect host, and a species of flagellate was found by the author in the salivary glands, but not in the intestine of that species of bug.

A. A.

Patane (Carmelo). Un caso di flagellosi intestinale da *Bodo caudatus* (Prowazekia) osservato nell'uomo in Cirenaica. Altri reperti locali dello stesso flagellato nella natura equale coprozoo—nell' intestino dell'uomo e di erbivori. [**Case of Human Infestation by** *B. caudatus* **in Cirenaica.**]—*Pathologica.* 1925. Nov. 15. Vol. 17. No. 408. pp. 606–613. With 2 text figs. [24 refs.]

Upon the text of an Arab suffering from obstinate "dysenteriform enteritis," in whose faeces there was found Bodo along with *Entamoeba coli* and *Blastocystis hominis*, the author has here opened out an elaborate monograph on *Bodo caudatus*—its history, synonomy, changing morphology, cultivation, and diverse occurrence in Cyrenia—ending with a bibliography of 24 separate items. The conclusion leads to the usual trivium—banal coprophile, innocent commensal, possibly and occasionally and conditionally harmful and a parasite—which ?

A. A.

i. Hegner (Robert W.). **Studies on Bird Malaria.** *Southern M. J. Jl.* 1926. May. Vol. 19. No. 5. pp. 377–381. [6 refs.]

ii. Wülker (G.). Zur Kenntnis der Hämosporidien. [**The Haemosporidia.**]—*Cent. f. Bakt.* I. Abt. Orig. 1926. Vol. 97. No. 4/7. pp. 213–218. [13 refs.]

iii. Yakimoff (W. L.). Notes de parasitologie. [**Parasitological Notes.**] —*Ann. Soc. Belge de Méd. Trop.* 1926. Jan. Vol. 5. No. 2. pp. 127–135. With 13 text figs. [9 refs.]

iv. Tanabe (Misao). **Morphological Studies on Trichomonas.**—*Jl. Parasit.* 1926. Mar. Vol. 12. No. 3. pp. 120–130. With 41 figs. on 2 plates. [9 refs.]

v. Perekropow (G. I.). Zur Frage ueber die Parasiten vom Typus Sergentella. **Parasites of Sergentella Type.**]—*Rev. Microbiol. et Epidémiol.* 1925. Vol. 4. No. 4. German summary pp. 137–138. [In Russian pp. 49–51. With 2 text figs.]

vi. Guérin (F.). Infection par "*Nyctotherus africanus.*" [**Infection by** *N. africanus.*]—*Ann. Soc. Belge de Méd. Trop.* 1926. Jan. Vol. 5. No. 2. p. 119.

i. This is a pleasant résumé of work by the author, Benharel, Boyd, Taliaferro, and Whitmore, which has already been noticed.

ii. A retrospective summary not containing anything new.

iii. Notes and crude figures of "new" flagellates observed in stools of man and mice, etc.

iv. Descriptions and figures of numerous species of Trichomonas, including new species from rabbit, kangaroo, screech-owl, grouse, and stag-beetle (Passalus).

v. Brief note on some small bodies, here named *Sergentella jakimowi*, found in a 10 or 11-year-old blood-film from a patient who had suffered for about three years from headache, irregular fever, anaemia, progressive debility, and an enlarged spleen and liver, supposed to be due to chronic malaria, although malaria parasites were not discovered

vi. A note of the finding in the stools of "*Nyctotherus africanus,*" without any concomitant pathological symptoms or signs.

A. A.

van Someren (V. G. L.) & de Boer (H. S.). **Report on the Mosquito Breeding Areas within the Nairobi Municipal Area, with Special Reference to Waters containing Anopheline Larvae.**—*Kenya Med. Jl.* 1926. Jan. Vol. 2. No. 10. pp. 276–298. With 16 plates, 1 map & 2 charts. [1 ref.]

This report of a well-planned and carefully-performed survey will prove of great value, for although Nairobi has been reputed to be free

from malaria the reputation is known to be undeserved. It is to be understood that so far as continuous and systematic observations go this report deals with breeding-places and the specific larvae found there. Altogether, 11 species of Anopheles and 42 species of Culicini —of which 21 are Culex—have come to light. The survey included all the land lying within the municipal bounds, and in one direction just beyond, the whole tract being mapped and divided into 18 areas of observation. Each area was visited regularly once a week throughout the year by native collectors, surprise supervisional visits being made at intervals. The individual areas are here described with the nature of the breeding-grounds and the species of Anopheline larvae found in each. In the presentation of the results preference is given to the Anophelines, eleven plates of various types of breeding-places being shown and four plates of larvae. The 11 species of Anopheles found are *A. costalis, cinereus, christyi, mauritianus, pretoriensis, transvalensis, funestus, marshalli, maculipalpis, squamosus*, and *rhodesiensis*. The most abundant as well as the widest in range was *A. costalis*, the other species being spoken of as "somewhat scarce." Although no complete observations are recorded of the adults, a systematic notice was taken of those found in dwellings and outhouses in the well-populated neighbourhood of one particular area devoted to market-gardening and extensively irrigated. In this neighbourhood adults of 6 species were captured in the various buildings in one compound, 3 species—*costalis, cinereus*, and *christyi*—having been taken in every month of the year.

Of the Culicini occurring in Nairobi, *Stegomyia fasciata* and *Culex fatigans* may be noted.

A. A.

Senior-White (Ronald). **Physical Factors in Mosquito Ecology.**—*Bull. Entom. Res.* 1926. Jan. Vol. 16. Pt. 3. pp. 187–248. With 8 figs. [56 refs.]

It is many years now since Malcolm Watson suspected that it is something in the water itself rather than in its gross physiographical environment that determines its fitness as a breeding-medium for Anopheles, and thence hinted at the possibility of finding some means of controlling that insect simpler and less costly than drainage or than continual oiling. Later on Lamborn took up the wondrous tale, and then MacGregor showed how Anopheles larvae could be wrecked by a change in the pH concentration of the water and by the homely operations of the *dhobi*. The present author has approached this fascinating subject with all the apparatus of exact measurement, and he gives us here the results of a year's continuous and laborious study of mosquito-breeding waters in Ceylon. In the course of hundreds of observations he has collected an enormous volume of most interesting detail, which, however, it is impossible to summarize, though the method and scope of his investigations may be noticed for the guidance of other workers.

The first set of facts to be determined, as regards both natural and artificial waters, was the exact extent of toleration, by the mosquito-larvae living in them, of pH concentration and of total dissolved solids, oxygen, and saline ammonia (the important factor of albuminoid ammonia not being included in the survey. Since these combined factors may be assumed to act more directly on the vegetable

organisms upon which the larvae feed than upon the larvae themselves, another matter of great interest was to make—as was made—a comprehensive survey, with specific determinations, of the algae inhabiting the observed waters. Then the various natural phenomena known or inferred to be detrimental to the life of larvae were observed and considered. Finally, some typical bodies of water were kept under periodic observation for a year, so that the seasonal play of the factors under study might be watched, and the associations of particular species observed.

The following are some of the main conclusions : In Ceylon mosquito larvae in general are found only between pH 5·8 and 8·6 ; species living in moving water having a wider tolerance than those in standing water—the former into acidity, the latter into alkalinity—and anophelines a wider tolerance than culicines. Natural-water-breeders are intolerant of any acidity not caused by CO_2. [The "total" solids in solution were measured in terms of electrical conductivity, and are so expressed ; but the limits, even in natural waters, appear—as indeed they do to common observation—to be extensive, i.e., from 62–922. Waters in which dissolved oxygen is low are not favoured by Anopheles ; for instance, *Anopheles listoni*, the only malaria-carrier commonly breeding in ricefields in Ceylon, was found to be dependent on a considerable amount of oxygen. *Saline* ammonia in amounts of less than 1 per million in natural waters was found to be inhibitory, especially to anophelines. A "feeding-association" of certain mosquitoes, mainly anophelines, with certain algae was observed, in other words, certain species are commonly found in association. The author is to be congratulated upon a fine piece of work ; but one may be permitted to point out that his proposal to regard as "biological races" those larvae of a given species which happen to be found outside the usually observed chemico-physical tolerance of that species takes him quite outside the canons of inductive logic.

A. A.

Borel (E.). Note sur un procédé simple pour empêcher la ponte des moustiques dans les collections d'eaux familiales indigènes. [**A Simple Way of preventing the Deposit of Mosquito Eggs in Domestic Water Collections.**]—*Bull. Soc. Path. Exot.* 1925. Dec. 9. Vol. 18. No. 10. pp. 779–781.

The author relates that at Saigon he came upon an old lime-cask still completely encrusted with lime and part filled with rainwater, in which he could not find any mosquito larvae, though larvae of Stegomyia and Anopheles were to be seen in other kinds of water-vessels close by. In water taken from the old lime-cask, however, larvae of *Aëdes albopictus* and *argenteus* and *Anopheles vagus* lived happily in the laboratory, though the water had a pH tension of 9·3 and contained "75 mgm. of carbonate of lime." Struck by the paradox that it was the barrel and not the water that appeared to be obnoxious, the author set out together three glazed earthenware vessels, one thickly whitewashed all over inside and out, the other whitewashed in one half, and the third not whitewashed at all. Rainwater soon collected in them, and though larvae of *Aëdes albopictus* and two species of Culex appeared in due time in the other two vessels, no larvae appeared in the completely-whitewashed vessel. Larvae, however, that were transferred to the completely-whitewashed vessel, lived and grew

quite well in it. The obvious conclusion is that it was the uniform whiteness of the vessel that repelled the pregnant females, and this conclusion was confirmed by the fact that when in the course of two months the white vessel became discoloured by encrustations of algae pregnant mosquitoes laid their eggs on its water. These observations undoubtedly appear to be of value for dealing with domestic mosquitoes.

A. A.

MacGregor (Malcolm E.). **Some Effects of Electric Current on Mosquito Development.**—*Bull. Entom. Res.* 1926. Mar. Vol. 16. Pt. 4. pp. 315–317.

Miscellaneous observations of some details of the behaviour of mosquito larvae in the course of some experiments upon altering the pH reaction of water by the passage of electric currents. Larvae were killed by a current (roughly estimated) of 250 milliamperes at a voltage of 100, after five minutes, but the vitality of eggs was not affected by a current at a pressure of 150 volts for several hours.

A. A.

Barber (M. A.) & Hayne (T. B.). **Water Hyacinth and the Breeding of Anopheles.**—*Public Health Rep.* 1925. Nov. 20. Vol. 40. No. 47. pp. 2557–2562. [5 refs.]

Water Hyacinth (*Piaropus* [*Eichornia*] *crassipes*), of the Natural Order Pontederiaceae, is a native of South America which has spread northwards to Texas and Florida and eastwards all across the Oriental region, and also into Japan and Australia. In some places it has become a pest, destroying navigation and fisheries and endangering bridges. It has been said to harbour crustacea and small fishes that eat Anopheles larvae, and on the other hand it has been said to interfere with the action of larvicides and larvivorous fishes. Its influence, and its further spread, should therefore be watched.

A. A.

Iyengar (M. O. T.). **The Anopheline Fauna of a Swamp in Bangalore.**—*Indian Jl. Med. Res.* 1926. Jan. Vol. 13. No. 3. pp. 697–702. With 8 figs. on 3 plates & 1 sketch map. [3 refs.]

There are several points of general interest in this paper. Larvae of *Anopheles karwari* and *maculipalpis* were found in large numbers in a mere film of seepage. In *Anopheles fumestus* var. *listoni* and *A. jeyporensis* the tail-hooks are very powerful, so that the larvae can anchor themselves to vegetation in a strong current. Larvae of "*A. fowleri, fuliginosus, jamesi, barbirostris,* and "*hyrcanus*" were observed in profusion in pools where water weed, among which Chara was predominant, formed dense mats near the surface. The easy adaptability of *A. stephensi* is noted: its larvae have been observed in domestic vessels, old tins, cisterns even of filtered water, wells in cellars where no sunlight enters, pools, streams, brackish water, and briny sea-water.

A. A.

Cuboni (E.). Osservazioni sulla biologia dell' "*Anopheles superpictus*" e dell' "*Anopheles algeriensis*" e caratteri differenziali delle loro larve. [**Observations on Biology of** "*Anopheles superpictus*" **and** "*A. algeriensis*"; **Differential Characters of their Larvae.**]—*Riv. d. Malariologia.* Rome. 1926. Jan.–Feb. Vol. 5. No. 1. pp. 49–53. With 4 figs. on 1 plate. [3 refs.] English summary pp. 111–112.

Although *A. superpictus* has "domestic habits" its larvae are only found far away from habitations. Although the larvae of *A. algeriensis* are abundant the adults are very rarely seen. The observations refer to Calabria. The differential characters of the larvae of the two species are tabulated and figured.

A. A.

Boyd (Mark F.). **A Note on the Rearing of Anopheline Larvae.**—*Bull. Entom. Res.* 1926. Mar. Vol. 16. Pt. 4. p. 308.

Some of us who have tried breeding Anopheles on a large scale in a big city have had to give it up; your eggs may hatch in thousands and for a time your water may be covered with larvae in shoals; but your larvae sooner or later stop growing, and in the end you may get a score or so of undersize adults. Harold (this *Bulletin*, Vol. 21, p. 142) has shown one way to success on a large scale, and Lamborn in Malaya was always able to breed Anopheles by feeding the larvae on Eugloena; and now the present author describes how he reared *A. crucians* and *quadrimaculatus* with great success. The water was kept in slow circulation by siphons, and yeast was daily rubbed into its surface-layer as food; marble dust was kept in the pans to preserve the alkalinity of the water; the optimum water temperature for these two species was 70°–80° F. If the water be not kept in circulation it must be changed every two or three days to avoid fouling by decomposing yeast.

A. A.

Blacklock (D. B.) & Evans (A. M.). **Breeding Places of Anopheline Mosquitos in and around Freetown, Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1926. Feb. 11. Vol. 20. No. 1. pp. 59–84. With 1 map, 4 figs. on 1 plate & 10 text figs. [15 refs.]

The particular interest of this valuable report is, of course, local. It has, however, points of general interest apart from its main general aspect as a model of what a survey and a survey-report of this subject should be.

Of the 8 species of Anopheles—*costalis*, *funestus*, *rhodesiensis*, *smithii*, *marshalli* var. *freetownensis*, *squamosus*, *theileri* –found breeding in or near Freetown, by far the most numerous, though its numbers appear to have been reduced by some recently established restrictions, is the dangerous *A. costalis*. Its breeding-places were almost invariably well open to the sun; in the town places worthy of general notice were at the junction of lateral street-drains with a brook, pools in laterite street-drains, shallow pits dug in laterite, a concrete washing-tank, and canoes lying on the beach; its larvae were not found in tins, bottles, etc., nor in domestic pots, rot-holes, or axils of leaves, but they were found in abundance in pools in a brook within a few yards

of its union with the sea. *A. rhodesiensis*, though not numerous, has a wide range and notable powers of adaptation to a variety of breeding-grounds.

A. A.

Evans (A. M.). **Notes on Freetown Mosquitos, with Descriptions of New and Little-Known Species.**—*Ann. Trop. Med. & Parasit.* 1926. Feb. 11. Vol. 20. No. 1. pp. 97–108. With 1 plate & 3 text figs. [8 refs.]

The little-known species is *Anopheles smithii*, Theob., of which the wing-markings are variable in both sexes, although not identically variable in the two sexes. The author confirms Christophers' opinion that the so-called *A.* (*Feltinella*) *pallidopalpi* of Theobald is a synonym of this species.

A. A.

Alessandrini (G.). Lo studio biologico della risaia. **The Biological Study of the Rice-Field.**—*La Risicoltura e la Malaria nelle zone risicole d'Italia.* Rome, Minist. Interno e Economia Nazionale. 1925. 33 pp. With 6 figs. [Summarized in *Rev. Applied Entom.* 1926. Jan. Vol. 14. Ser. B. Pt. 1. pp. 15–16.]

According to the summary, Alessandrini is of opinion that Anophelines in some non-malarious rice-growing districts in Italy are so much more vigorous than Anophelines from marshy tracts that they can resist infection and therefore cease to be carriers of malaria. [No evidence of their power of resistance is given, and the presumption of their superior vigour appears to be based on certain features and circumstances of life of their larval stage.] The larvae of the rice-fields are larger on the whole, fatter, and of tougher tissue, and they feed on algae rich in chlorophyll: whereas the marsh-larvae are enfeebled not only by bad and indigestible food (bacteria and protozoa) and by the poisonous decompositions that occur in marshes, but also—since marsh-water is poor in dissolved oxygen—by their constant journeys to the surface for air. [The fact that Anopheles larvae usually rest at the surface and take in air chiefly from the atmosphere direct, appears to be unduly discounted.]

It is mentioned that these vigorous ricefield larvae have a strong predilection for green algae, and are so green both in themselves and in their "phototropism" that Paris green has a most fatal attraction for them. [This attraction is not superfluous, as it appears to be at first sight, since the vigorous adults that issue from these green larvae though ceasing to transmit malaria still cause annoyance by their bites.]

A. A.

Kerandel (J.). Riziculture et distribution géographique du paludisme en Indochine. Insectes prédateurs de larves de moustiques. **Rice Culture and Distribution of Malaria in Indo-China.**—*Bull. Soc. Path. Exot.* 1925. Dec. 9. Vol. 18. No. 10. pp. 815–821.

The author observes that in Indo-China malaria is peculiarly prevalent in the hilly tracts where the rice-fields are terraced and water

continuously trickles from terrace to terrace ; and that in the stagnant ricefields of the low country and big deltas, on the other hand, malaria is absent or relatively rare. His explanation is that there are not only fishes but also carnivorous insects in the stagnant waters of the deltas, whereas in the trickling waters of the terraced ricefields there is no such fauna to prey upon the Anopheles larvae. He admits the difficulty of interfering with the traditional native methods of cultivation.

A. A.

Shingarev (N. I.). **New Data on the Culicidae of U.S.S.R. (Russia).**]—*Russian Jl. Trop. Med.* 1926. No. 2. pp. 47–48. [In Russian.]

The paper is a preliminary report on the anopheline fauna of Russia. Up to the present only eight species of the genus *Anopheles* have been recorded (*A. maculipennis*, Mg., *A. elutus*, Edw., *A. bifurcatus*, L., *A. plumbeus*, Stph., *A. hyrcanus*, Pall., *A. hyrcanus* var. *pseudopictus*, Grassi, *A. superpictus*, Grassi, *A. pulcherrimus*, Theo.). To these the author adds the following, four of which are new : *A. aitkeni*, James (Caucasus), *A. listoni*, List. (Turkestan), *A. algeriensis*, Theo. (Turkestan and N. Caucasus), *A. algeriensis* var. *turkestani*, nov. (Turkestan), *A. hyrcanus* var. *mesopotamiae*, Chr. (Bokhara, Turkestan), *A. hyrcanus* var. *marzinovski*, nov. (Caucasus), *A. superpictus* var. *berestnevi*, nov. (Turkestan), *A. martinius*, n.sp. (Turkestan). The author promises a detailed description of the new forms in a paper entitled " A Revision of the Malarial Mosquitoes of U.S.S.R."

C. A. Hoare.

van Thiel (P. H.). Maxillenzahnzahl und Flügellänge bei *Anopheles maculipennis*. [**Number of Maxillary Teeth and Length of Wing in** *A. maculipennis*.]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1926. Vol. 30. No. 1. pp. 67–75. With 2 charts in text. [11 refs.]

Comparing, with mathematical precision, females of *Anopheles maculipennis* from different localities, the author finds evidence of local " populations " (? races) with differential characters expressed in correlation between length of wing and number of maxillary teeth—*e.g.*, the bigger females of Leiden have fewer maxillary teeth than the smaller females of Bolsward. The morphological differences may possibly depend on salinity of the waters in which the larvae are bred. The possibility of a connexion in Holland between malaria and salinity of water is suggested.

A. A.

Rodenwaldt (Ernst). **Entomological Annotations. III.** *-Meded. v. d. Dienst d. Volksgezondheid in Nederl.-Indië.* 1926. Pt. 1. pp. 79–98. With 34 figs. on 3 plates.

Many facts point to *Anopheles rossi* as an important agent in spreading malaria in Celebes, where that species is very abundant. *Anopheles* (*Myzomyia*) *parangensis* of Ludlow, a species common in Celebes, but of undetermined pathogenous import, is redescribed (adults and larva) and is figured. *Anopheles* (*Myzomyia*) *ludlowi* var. *sundaica* is described and figured in extraordinary detail. A distribution-table of the Anopheles of Netherlands-India is given.

A. A.

i. Langeron (M.). Sexualité des larves de moustiques. [**Sex of Larvae of Mosquitoes.**] *Ann. Parasit. Hum. Comp.* 1926. Apr. 1. Vol. 4. No. 2. pp. 126–135. With 8 text figs. [4 refs.]

ii. Roubaud (E.) & Colas-Belcour (J.) La torpeur hivernale obligatoire et ses manifestations diverses chez nos moustiques indigènes. [**Hibernation and its Several Manifestations in Mosquitoes of France.**]—*C.R. Acad. Sci.* 1926. Mar. 29. Vol. 182. No. 13. pp. 871–873. [3 refs.]

Roubaud (E.). Sur quelques phénomènes peu connus de la vie des moustiques. [**Some Little-known Phenomena in the Life of Mosquitoes.**]—*Bull. Soc. Path. Exot.* 1926. Apr. 14. Vol. 19. No. 4. pp. 259–260. [1 ref.]

iii. Sergent (Et.). Quelques parasites des culicides. [**Parasites of Culicids.**]—*Arch. Inst. Pasteur d'Algérie.* 1925. June. Vol. 3. No. 2. pp. 155–168. With 12 text figs. [15 refs.]

iv. Nuñez Tovar (Manuel). Mosquitos y flebotomos de Venezuela. [**Mosquitoes and Phlebotomi of Venezuela.**] *Gac. Méd. de Caracas.* 1925. July 15, 31 & Aug. 15. Vol. 32. Nos. 13, 14 & 15. pp. 203–206; 214–223; 232–233.

v. la Face (Lidia). Revisione degli Anofelini Italiani. Nota I. [**Revision of Italian Anophelinae Note I.**] *Rend. R. Malariol.* Rome. 1926. Jan.–Feb. Vol. 5. No. 1. pp. 44–48. With 9 figs on 2 plates. [3 refs.] English summary p. 111.

vi. Faust (E. C.). **A Preliminary Check List of the Mosquitoes of the Sino-Japanese Areas.**—*China Med. Jl.* 1926. Feb. Vol. 40. No. 2. pp. 142–143.

vii. Ferguson (E. W.). **Mosquitoes of New South Wales.**—*Rep. Director-General of Pub. Health New South Wales for Year 1924.* pp. 187–191.

i. The author draws attention to the easy visibility of the testes in Culicid larvae—first noticed by Mrs. Helen Adie in 1912—as a pair of more or less piriform sacks—of a dark brown colour in Anopheles—lying mostly in the 6th abdominal segment. He is of opinion that the determination of the sex of the larva is of practical value in seasonal control of Anopheles.

ii. These two papers deal with the same subject, namely, the "asthenobiosis" or hibernation of mosquitoes. [The senior author appears to overlook the great truth that *all* the vital phenomena that are so simple by familiarity are mysterious complexities.]

iii. Miscellaneous brief notes on various Protozoan parasites and a mite found in or on mosquitoes in larval and adult stages in Corsica. Included among them are some descriptive remarks on and some figures of the sporozoites of *Plasmodium relictum*. The numerous illustrations would be useful to anyone working at this subject.

iv. Of local interest. A catalogue of the Culicidae and the species of Phlebotomus known to occur in Venezuela; it is descriptive so far as concerns 2 species of Anopheles and 35 species of Culicines not before recorded as occurring in Venezuela, and the five species of Phlebotomus.

v. The author agrees with Grassi that *Anopheles elutus* is a variety of *A. claviger* [*maculipennis*]; neither the absence of egg-floats nor the different number of hairs on the basal lobes of the male hypopygium are characters of specific constancy.

vi. This list has been compiled from the published records, and therefore is "fairly complete" for South China only. The dangerous species in South China are said to be *A. rossi*, *A. sinensis*, and *A. maculatus*.

vii. A list compiled from Edward's Synopsis of the mosquitoes of the Australasian Region.

A. A.

Austen (E. E.). **Concerning the Nomenclature and Synonymy of Certain Oriental and East African Bloodsucking Muscids (Diptera).**—*Bull. Entom. Res.* 1926. Mar. Vol. 16. Pt. 4. p. 307.

The author points out that Patton (*ante*, p. 284) as a censor may be not less fallible than the entomologists who come under the censor's correction. *Haematobia nudinervis* of Stein has *not* priority of *Bdellolarynx sanguinolentus* of Austen, nor does the author accept Patton's decision that Bdellolarynx and Haematobia are generically identical. Patton's recent discovery of the identity of Grunberg's genus "Glossinella" with Lyperosia was well established in 1909, although his conjectured identification of "*Glossinella*" *schillingsi* with *Lyperosia minuta* of Bezzi can be shown to be indefensible.

A. A.

Shortt (H. E.), Barraud (P. J.) & Craighead (A. C.). **An Account of Methods employed in Feeding and Re-Feeding Sandflies, *Phlebotomus argentipes*, for the Second and Third Time, on Man and Animals.**—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 923–942. With 1 plate. [4 refs.]

The authors' earlier experience in Assam has been that the sandfly *Phlebotomus argentipes* died on the 4th or 5th day after being experimentally fed in the laboratory, owing to difficulties of parturition; and that since it could not be induced to feed a second time before parturition it appeared impossible to determine the question whether an individual experimentally infected with *Herpetomonas donovani* became infective by its bite.

In the present paper it is shown that the necessary survival of the fly can be secured in the natural breeding-season of this species when a suitable humidity is concurrent with a temperature ranging 1°–2° around 28° C. Under these conditions *P. argentipes* survives parturition in the laboratory and can be induced to feed (on mice, monkeys, and rabbits, as well as on man, cattle, and goats) a second or third time. Unfortunately, the "suitable humidity" cannot be exactly defined; it has to be settled by experience.

For obtaining a very heavy infection the second feed of the fly should be "on the same kala azar case as the first feed, or on an animal."

A. A.

Adler (S.) & Theodor (O.). **On the *Minutus* Group of the Genus *Phlebotomus* in Palestine.**—*Bull. Entom. Res.* 1926. Mar. Vol. 16. Pt. 4. pp. 399–405. With 6 text figs. [10 refs.]

The particular sandflies found by the authors in Jericho are *P. minutus* of Rondani, *P. minutus* var. *africanus* of Newstead, and a single female specimen in some respects intermediate between the other two, but having what they describe as strikingly different spermathecae from one of them. Apart from the differences in spermathecae the authors state that these three forms can be discriminated, as regards the female, by certain features of the pharynx and buccal cavity. The males of the first two (the third is a female sole) can be less easily discriminated by corresponding, but much less pronounced, differences.

The authors' conclusion is that the characters of the pharynx, buccal cavity, and spermathecae are diagnostic of the three several species. [The said characters, which are illustrated by enormously

enlarged figures, would be difficult to describe. The authors do not say how many specimens of what they can otherwise determine as *P. minutus* and *P. africanus* they have compared, and they state that they had only one specimen of the third form (in some respects intermediate) for comparison. Moreover, the figure of a spermatheca of this third form appears to the reviewer to be essentially similar to the corresponding figure of *P. africanus*.]

A. A.

Sinton (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part XV.**—*Phlebotomus newsteadi* **n. sp.**—*Indian Jl. Med. Res.* 1926. Jan. Vol. 13. No. 3. pp. 559–563. With 8 figs. on 1 plate. [2 refs.]

Three specimens of this interesting new species—characterized by its large size (3·3–3·7 millim.), conspicuously long legs, and remarkably broad halteres—have been caught at Kasauli.

A. A.

i. Popoff (Peter). **An Attempt to Steading [? Study] Phlebotomus in Turkestan.**—*Russian Jl. Trop. Med.* 1926. No. 1. English summary p. 28. [In Russian pp. 15–20. 18 refs.]

ii. Popow (P. P.). Ueber einen neuen russischen Phlebotomus und die bisher in Russland entdeckten Phlebotomen. [**A New Russian Phlebotomus and the Phlebotomi already Known in Russia.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1926. June 1. Vol. 30. No. 6. pp. 240–248. With 4 text figs. [12 refs.]

i. It is stated that Oriental sore and kala azar occur in many places in Turkestan and that *Phlebotomus papatasii*, *P. minutus* and *P. perniciosus* exist there as well as two local species known as *P. caucasicus* and *P. li*.

ii. Describes and figures *Phlebotomus li*, a new species from Turkestan.

A. A.

Veneroni (Carlo). Le "Myiasi" nella Somalia Italiana. [**Myiasis in Italian Somaliland.**]—*Riforma Med.* 1926. May 3. Vol. 42. No. 18. pp. 416–417. With 1 text fig.

A sketchy article, not containing much that is original. In Somalia, myiasis is said to be not rare, but not much studied. Cordylobia is said to exist there and another species found in skin lesions is a *Lucilia*, probably identical with *argyrocephala*, which also attacks domestic animals. The author has also observed intestinal myiasis due to another, undetermined, species.

A. A.

Wupperman (R. C.). **A Case of Myiasis of Antrum of Highmore.** [Memoranda.]—*Jl. Port-of-Spain Med. Soc. for 1924.* pp. 104–105.

The patient in this case was admitted for an inflammatory swelling over the right supra-maxillary region and an offensive discharge from the nostril, without any evidence of necrosis of the nasal bone

He had a long-past history (38 years' interval) of a blow on the nose and an operation for deviation of the septum. On opening the antrum of Highmore a large quantity of thin sanguineous pus and about 30 maggots of *Cochliomyia macellaria* came away. The antrum was scraped with a blunt spoon, irrigated, and drained, and 2 or 3 maggots would come away through the opening in the antrum or through the nose whenever the cavity was washed out during the following 10 days. Recovery was complete in 2 weeks.

A. A.

Parman (D. C.). **Benzene as a Larvicide for Screw Worms.**—*Jl. Agric. Res.* 1925. Nov. 1. Vol. 31. No. 9. pp. 885–888. 1 ref.

In larvicidal power benzene ranks with ether, chloroform, carbon tetrachloride, and xylene. For maggots in a wound it is not so good as chloroform and carbon tetrachloride unless the wound be dry, since it floats instead of mixing with the serum.

A. A.

Sierhoven Jr. (J. H. Schuurmans). **Studies on *Hippobosca maculata* Leach and *H. equina* L. in the Dutch East Indian Archipelago.**—*Parasitology.* 1926. Jan. Vol. 18. No. 1. pp. 35–50. With 1 plate, 1 map & 5 text figs. [14 refs.]

The author has observed *Hippobosca maculata* in the D.E.I. Archipelago, where it is a serious pest of horses on the particular islands of the Timor Archipelago. He describes the more important characters of the male, female, and pupa, and the interesting events of the life-history. The number of ova produced by a female ranges between 6 and 10, but the number of pupae actually developed is only between 4 and 6. The pupa is born 12 to 14 days after the pairing of the sexes. Pupae are deposited in holes and cracks in the woodwork of stables, fences, etc., in crevices in the bark and about the roots of trees, between stones, and possibly on pasture grounds. The pupa stage lasts, on an average, 25 days, though occasionally an imago may be found alive but unable to free itself, at 49 days. The principal local host is the horse; in one batch of 37 horses 7,160 flies were collected after dipping, in another batch of 27 horses 16,225 flies; in another batch of 4 horses 4,358 flies. Other local hosts are Bengali cattle, buffalo, goat, sheep, dog rarely, man exceptionally. Natural enemies of the flies are spiders, the cattle egret (*Bubulcus coromandus*), and a species of digger wasp.

A. A.

Nigeria. Sessional Paper No. 1 of 1926. **Report of the Tsetse Fly Conference held at Kaduna, September, 1925.**—45 pp. 1926. Lagos: Govt. Printers.

The greater part of this report consists of matter with which those who are interested in tsetse-fly control have for some time been well acquainted—matter circulated mainly for the benefit of non-professional

members before the assembling of the Conference. The essence of the Report appears in a paper by Dr. W. B. Johnson and Mr. Ll. Lloyd which is to be found in an Appendix. These authors state that sleeping-sickness is increasing in the northern provinces of Nigeria and, that its increase is attributable not to increased spread of the tsetsefly, but to: (1) a tendency of the inhabitants to start small scattered farms; (2) to the freer movement of the people in modern times; and (3) to the play of large enterprises like railway construction and mining, where labour is being brought in touch with colonies of fly. They believe that they can eradicate the fly from the northern provinces by the method of clearing and settlement which creates an environment unsuitable for it. They have proposed to make an experiment to this end in an area of about 30 square miles draining into Lake Chad, where the water-courses are bordered by dense fly-infested thickets. This area they propose to be cleared, settled, and cultivated. Two local Emirs have been interested in the project which now only requires authoritative sanction. If the experiment prove as successful as Swynnerton's similar but larger experiment in East Africa it would be natural to expect that the method of control by clearing and big settlement would be generally adopted. The authors recognize that this would be a matter of special administration on the basis of co-operation between the sanitary, veterinary, agricultural, forestry and mining departments, and this Conference, held at Kaduna, on the 25th of September, 1925, is the outcome of their proposals.

In the organization of settlement schemes of tsetse-fly control various interests outside the sanitary department are affected, and information must be collected from various sources. The *Administrative Service* would have to consider how native chiefs could be interested in the subject; how natives could be induced to settle in the cleared lands—by remission of taxation and forestry fees, by exemption from forced labour outside their settlement, by bonus, by digging them wells and making them roads, by free or cheap issue of farming implements; how pressure might be brought to bear on the native administration; whether late grass burning could be enforced, whether the existence of small scattered farms could be forbidden; whether immigration of alien natives could be permitted; and whether political officers could be spared and seconded for co-operation and supervision. The views of the *Veterinary Department* will be wanted upon the effects of late burning upon pasture; upon movements of cattle; and upon the stationing of veterinary officers or the starting of ranches in the cleared areas. The co-operation of the *Agriculture Department* comes in with advice on farming the cleared tracts; with the question of encouragement of settlers by distribution of seeds and implements; and with the question of departmental farms. In respect of the *Forest Department* it is necessary to know whether clearing is likely to lead to desiccation, and whether late burning of grass would affect the forest reserves; the department also can give advice in methods of clearing. The *Mining* industry is touched in the matter of regulations for medical supervision of labour, for compulsory clearance sufficient to keep large gangs of men separate from fly; even for actual prohibition in districts where trypanosomiasis is prevalent; similar questions affect the *Railway Department*. Last come the questions of the necessary staff and the cost.

It is the scope and nature of the questions that is of a general interest; but the opinion of the Veterinary and the Forest Departments that

late burning of grass, if continued, ruins pastures and leads to desiccation, may be noted. The Forest representative also expressed his conviction that the segregation of fly infested areas is futile so long as the ubiquitous and large-scale annual migrations of Fulani cattle are permitted or are uncontrolled; movement should be confined to special "lanes" 8 to 10 miles wide, and these lanes should be lanes of clearance and settlement.

The Conference agreed to the proposed experiment in clearance and settlement, and to the extension of survey work, and it admitted the necessity of supervisionary measures in connexion with mining and railway construction. It "found itself in agreement" with the suggestion of a subsidy of £10,000 for 1926–27, of £15,000 for 1927–28, and of £20,000 for 1928–29, for tsetse-fly investigation. It approved the proposal that five medical officers and one administrative officer should be seconded for tsetse-fly and trypanosomiasis investigation, and that one officer from each of the agriculture, forestry, and veterinary departments should be available for assistance; and it recommended that an organizing committee should be formed with the Senior Tsetse Investigator as chairman.

A. A.

Rodhain (J.). Le recul de la tsétsé: *Glossina morsitans* devant l'occupation européenne au Katanga. [**The Retreat of** *G. morsitans* **before the European Occupation of Katanga.**] *Bull. Soc. Path. Exot.* 1926. Mar. 10. Vol. 19. No. 3. pp. 222–235. With 1 text fig. [3 refs.]

This paper is full of detail. Its conclusions, of general interest, are that in Katanga in the regions of Elizabethville, Bukama, and Kabalo *Glossina morsitans* has disappeared from considerable tracts of woody savannah (park forest) since 1911–1912. In the higher and drier Elizabethville country this species has withdrawn beyond the cleared and settled land; but in the lower and more humid Kabalo country only to the limits of the cleared land. In the former country there has been a corresponding disappearance of big game animals; in the latter country only a thinning of their numbers.

In the case of *G. palpalis* there has been little change, this species having disappeared only in certain places in Bukama where the banks of the river have been cleared.

A. A.

Rodhain (J.). Existence d'un foyer de glossines du groupe *morsitans* dans le Bas-Ouellé. [**A Focus of Tsetse of Morsitans Group in the Bas-Ouellé District.**] *Bull. Soc. Path. Exot.* 1926. Mar. 10. Vol. 19. No. 3. pp. 197–198. [1 ref.]

Notes the capture of a single specimen of a species of Glossina—which, since it is a female, cannot be identified more exactly than *morsitans* or *submorsitans* or *swynnertoni*, south of the Louna river,

between Lat. 4° and 5° N., and about Long. 25° E. The Louna is an affluent of the Gangou tributary of the Bili river, which again is a tributary of the Ubangi.

A. A.

Rhodesia Agricultural Journal. 1925. Sept. Vol. 22. No. 6. pp. 634–635. **Operations against Tsetse Fly.**

As tsetse-fly have been invading a settled area in the Lomagundi district an attempt is to be made to bar their advance. The barrier is to be a strip of land 10 miles wide (and 30 to 35 miles long) enclosed within two fences. The southern line of fence is to be erected first, and then as the northern line is being set up, in sections, the game will be driven out—not destroyed. The outside of the two fences will be further protected by brushwood; but nothing will be done to the strip of land enclosed within the fences except burning its brushwood in the course of driving out game, and clearing a margin of 50 yards just inside each line of fence. When all is finished the fences will be patrolled by a European with native assistants to keep the fences in repair and shoot any animals trying to break through the barrier.

A. A.

Jack (R. W.). **Tsetse Fly in the Lomagundi District. Experimental Operations.**—*Rhodesia Agric. Jl.* 1926. Feb. & Mar. Vol. 23. Nos. 2 & 3. pp. 134–150; 257–267. With 1 map & 7 figs.

This paper describes the inception of an experiment for preventing the spread of tsetse-fly from a focus lying about Long. 30° E. and Lat. 17° S. between the Angwa and Hunyani tributaries of the Zambesi. The local forest is described as mainly Brachystegia savannah, with some fringes of big forest in places along banks of streams. Big game of various species is fairly plentiful. Fly has been spreading from this area, probably because the settlers are really farmers and do not shoot much, the natives do not carry arms, and a dog-tax is levied.

To clear a belt of forest and maintain it clear, in order to stop the outset of fly, would be too expensive for a country so scantily populated and infertile. For the same reason killing off the fly by late grass fires is impracticable. In short the Swynnerton policy of enlisting the inhabitants is not feasible, since there is not a sufficiency of inhabitants to enlist to any purpose. The policy decided on, therefore, is to create a gameless buffer of forest between the fly-infested area and the farmers settled beyond it. Two fences have been set up along a front of about 30 miles between the Angwa and Hunyani rivers, one fence being along the edge of the settled country and the other fence being 10 miles outside it. The fences are six feet high, and are made of six to seven strands of 12½ gauge barbed wire stretched where possible on living trees as posts. The forest along either border of this fenced zone has been cleared to a depth of 50 yards, and beyond each border-clearing is an additional rampart of brushwood. Within the cleared zone the game has been expelled, and no cattle or sheep or goats are to be allowed to enter it. A European forest ranger with a staff of native hunters keep the fences, etc., in repair, and stop any return of game.

A. A.

i. Joff (I.). Materiali k Posnanju Fauni Ektoparasitov Nugo-Vostoka Rossii. [**Contributions to the Knowledge of the Fauna of Ectoparasites in South-East Russia.**] Ocherk Organisazii Isuchenia Fauni Ektoparasitov na Nugo-Vostoke. [**Outline of the Organization for the Investigation of the Fauna of Ectoparasites in the South-East of Russia.**]—*Vjestnik Microbiologii & Epidemiologii.* Saratov. 1925. Vol. 4. No. 4. pp. 53–64. [48 refs.]

ii. Lokhov (M.), Mitin (S.), Pokrovskaya (M.), Kotelnikov (G.), Mikhailov (A.), Ostretzova (M.), Dobrova (M.), Zakharova (A.), Shagurina (N.), Kniazevski (A.), Zinkovski (D.), Joff (I.). Materiali Zimnich Sporov 1923–24 i 1924–25 Godov po Ektoparasitam Shivotnich i Chelovieka. [**Materials collected during the Winter 1923-24 and 1924-25 from Domestic Animals and Man.**]—*Ibid.* pp. 64–75.

Percentage of fleas found on man and certain domestic animals :—

	Man.			*Dwellings.*			*Dogs.*			*Cats.*		
	P. irritans.	Ct. canis.	Ct. felis.	P. irritans.	Ct. canis.	Ct. felis.	P. irritans.	Ct. canis.	Ct. felis.	P. irritans.	Ct. canis.	Ct. felis.
In Towns	74	13	13	—	—	—	5	88	7	14	—	86
In Kirghese settlements ...	97	—	3	93	—	7	92	—	8	25	—	75
In Russian villages	98	—	2	95	—	5	25	74	1	24	11	65
Total ...	96	1	3	93	—	7	70	23	7	25	1	74

N.B.—Total number of fleas was 4,960.

One rodent flea (*Amphipsylla contigua*, Jord. & Roths.) was found on a dog. Similar findings had been formerly made by Nikanoroff, who found one *Amphipsylla* sp. on a human plague corpse and one *Ceratophyllus* (? *londinensis*) on a bed.

Wu Lien Teh & R.P.

Joyeux (Ch.). Les récentes acquisitions en entomologie médicale. [**Recent Work in Medical Entomology.**]—*Le Bull. Méd.* 1926. Jan. 27, 30. Vol. 40. No. 5. pp. 109–116.

This is merely a résumé of some not very recent work in medical entomology—the identity of the mite in ordinary itch and in Norwegian itch, itch due to food-mites and harvest mites, pathogenous effects of ticks, bite of Simulium, fleas and plague, transmission of *Loa loa*, tularaemia, pathogeny of Phlebotomus, persistence of Anopheles in temperate countries after disappearance of malaria.

A. A.

Marcenac (M.). Innocuité de *Galeodes olivieri* au Maroc. [**Harmlessness of *G. olivieri* in Morocco.**]—*Bull. Soc. Path. Exot.* 1925. Dec.9. Vol. 18. No. 10. pp. 781–793. [1 ref.]

Galeodidae (known in Southern India as "jerrimunglums"), great, heavy, spider-like creatures found chiefly in arid tracts of hot countries, are generally regarded as being, like Ancient Pistol, terrible of aspect but quite inoffensive in action. In northern Africa, however, *Galeodes olivieri* is reported among certain tribes to be as dangerous as a scorpion. The present author wishes to place it on record that this species too is innocuous.

A. A.

Wada (Hiratake). Klinische und experimentelle Untersuchung ueber die durch die Giftraupe *Dendrolimus spectabilis* verursachte Dermatitis und ihre Ursache (II. Mitteilung) : ueber das Gift des Stichhaars von *Dendrolimus spectabilis*. [**The Poison of the Nettle-Hairs of *D. spectabilis*.**]—*Japan Jl. Dermat. & Urol.* 1926. Mar. Vol. 26. No. 3. German summary pp. 6–7. [In Japanese pp. 230–244. [24 refs.]

The nettle-hairs of this caterpillar and the dermatitis caused by them have already been described (*ante*, p. 295) ; the present paper deals with the chemical nature of the venom.

A watery solution of the alcoholic extract of the powdered hairs is as active as the hairs of the living caterpillar in causing urticaria. The venom has no haemolytic action ; it does not contain either formic acid or cantharidin ; it gave no precipitin reaction with the serum of four men who had been stung by the hairs 4 months before.

A. A.

i. Martini. Die Stiche der Gliederfüssler und ihre Wirkung auf die Haut. [**Stings or Bites of Arthropods and their Effect on the Skin.**]—*Dermat. Woch.* 1925. Nov. 14. Vol. 81. No. 46. pp. 1650–1659.

ii. Seydel (Ch.). Le laboratoire d'entomologie. [**A Laboratory of Entomology.**]—*Bull. Méd. du Katanga.* 1925. Oct. Vol. 2. No. 5. pp. 247–249.

iii. Escomel (E.). Un nouveau pseudo-méloïde, insecte médicinal du Pérou. [**A New Pseudo-Meloïd from Peru.**]—*Bull. Soc. Path. Exot.* 1926. Mar. 10. Vol. 19. No. 3. pp. 198–201.

iv. Sternberg (Hugo). Ein Tierparasit in der männlichen Urethra. [**An Animal Parasite in the Male Urethra.**]—*Klin. Woch.* 1926. Feb. 5. Vol. 5. No. 6. pp. 229–230.

i. This is a good enough compilation, but is destitute of new facts or novel inferences.

ii. This paper states that an entomology laboratory has been established at Elizabethville, and gives some simple instructions for the killing and packing of insects.

iii. Another species of blister-beetles.

iv. Note of the finding of a larva of the common Ptinid beetle *Niptus hololeucus* (a casual cosmopolitan domestic pest) in the urine of a man suffering from post-gonorrhoeal urethritis.

A. A.

Adler (S.) & Theodor (O.). The Mouths Parts, Alimentary Tract, and Salivary Apparatus of the Female in *Phlebotomus papatasii*. With Addendum.—*Ann. Trop. Med. & Parasit.* 1926. Feb. 11. Vol. 20. No. 1. pp. 109–142. With 7 plates & 2 text figs. [8 refs.]

Alessandrini (Giulio) & Missiroli (Alberto). Sulla struttura dell' apparato respiratorio delle "Anopheles." On the Conformation of Respiratory Apparatus of "Anopheles."—*Riv. d. Malariologia.* Rome. 1926. Jan.–Feb. Vol. 5. No. 1. pp. 35–43. With 10 text figs. English summary p. 111.

Catanei (A.). Nouveaux gites à *Anopheles hispaniola* en Algérie.—*Arch. Inst. Pasteur d'Algérie.* 1925. June. Vol. 3. No. 2. pp. 138–139. [2 refs.]

——. L'importance des gites à anophèles constitués par les marelles qui se forment en été dans le lit des oueds d'Algérie.—*Arch. Inst. Pasteur d'Algérie.* 1925. June. Vol. 3. No. 2. pp. 140–141. [2 refs.]

Christophers (S. R.) & Barraud (P. J.). The Development of the Male and Female Hypopygium of *Phlebotomus.*—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 853–870. With 18 figs. on 4 plates. [13 refs.]

——. *A.* (*Myzomyia*) *pattoni*, a New Anopheles from Shan-Tung, North China; with Notes on some other Species of Anopheles from the same Locality.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 871–877. With 7 figs. on 1 plate. [4 refs.]

Cosimo (Basile Vito). Studio sui denti mascellari di anopheles catturati in varie regioni dell'Emilia e del Ferrarese.—*Ann. di Med. Nav. e Colon.* 1925. Nov.–Dec. Year 31. Vol. 2. No. 5–6. pp. 261–279. With 1 plate.

Hogue (Mary Jane). Studies on *Trichomonas buccalis.*—*Amer. Jl. Trop. Med.* 1926. Jan. Vol. 6. No. 1. pp. 75–89. With 15 figs. on 1 plate. [12 refs.]

Iyengar (M. O. T.). Occurrence of a Coprid Beetle, *Caccobius mutans*, Sharp, in the Human Intestines.—Reprinted from *Proc. Fifth Entom. Meeting held at Pusa, 1925.* pp. 201–202. With 2 figs. on 1 plate. [6 refs.]

Johnson (Henry A.). Occurrence of *Anopheles vestitipennis* in Porto Rico.—*Amer. Jl. Trop. Med.* 1926. Mar. Vol. 6. No. 2. pp. 153–155.

Kofoid (C. A.). The Occurrence of Cysts of *Councilmania lafleuri* Kofoid and Swezy in the Duodenal Drainage.—*Proc. Soc. Experim. Biol. & Med.* 1926. Jan. Vol. 23. No. 4. pp. 299–300.

—— & Allen (Ena A.). On the Culture in vitro of *Councilmania lafleuri* and *Endamoeba coli.*—*Proc. Soc. Experim. Biol. & Med.* 1926. Jan. Vol. 23. No. 4. pp. 300–301. [1 ref.]

Senevet (G.) & Rossi (P.). Note sur deux Ixodidés, parasites accidentels de l'homme.—*Arch. Inst. Pasteur d'Algérie.* 1925. Sept. Vol. 3. No. 3. p. 298.

Shortt (H. E.), Barraud (P. J.) & Swaminath (C. S.). Further Observations on the Breeding of *Phlebotomus argentipes* in Assam.—*Indian Jl. Med. Res.* 1926. Apr. Vol. 13. No. 4. pp. 943–946. [1 ref.]

Stankovíc (Sinisa). Zur Kenntnis von *Anopheles superpictus* in Mazedonien.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1926. Mar. 1. Vol. 30. No. 3. pp. 104–112. With 4 text figs.